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ABSTRACT

The study examined the relationship between the family environment of 124 hearing impaired children (9-13 years old) and academic achievement. Interviews focused on what parents do with their children, how they interact (the social-psychological family environment) as well as status characteristics in relation to their children's academic achievement. Among major findings was that the correlation of the overall family environment and academic achievement was not consistent across levels of status characteristics. Generally a more favorable learning environment predicted high achievement in academic content areas. Demographic variables, in order of the power and accuracy of the solutions, predicted high and low achievement better in reading comprehension than in math concepts. Overall, family environment variables were found to be the better predictors of academic achievement than were demographic characteristics. Implications for the framework of person-environment-behavior interaction on which the study was based are considered. Among appended material is the environmental measurement instrument. (CL)

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A STUDY OF FAMILIES AND THEIR LEARNING ENVIRONMENTS FOR DEAF CHILDREN

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Abstract

The purpose of this research was to study the relationship between the hearing impaired child's family environment and his or her academic achievement. The research problem was derived from a consideration of both press-needs theory and a social learning theory of family environments. Within this framework, family environment is considered one of the most pervasive influences on a child's development, and specific characteristics of the family are believed to effect certain cognitive and affective child outcomes.

Through focused interviews of 124 families with hearing impaired 9.5 to 13 year-olds, this research examined what parents do with their children, how they interact (the social-psychological family environment) as well as certain status characteristics in relation to their childrens' academic achievement.

Specifically, the study addressed six problems: 1) the underlying constructs of the family environment of hearing impaired children; 2) the effect of differences in family socio-economic levels, sex, ordinal position, family size, I.Q., type of student, and communication mode in school on the strength of the relationship between the family environment and academic achievement; 3) the relationship of the underlying constructs of the family environment and academic achievement of hearing impaired children; 4) the relationship of demographic classification variables and academic achievement of hearing impaired children; 5) the relationship of family environment constructs and academic achievement compared to the relationship of demographic variables and academic achievement of hearing impaired children; and 6) the differences in family learning environments of hearing impaired and hearing children.

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Table of Contents

Page

Abstract i

Acknowledgements ii

List of Tables vi

List of Figures viii

Purpose and Rationale 1

Theoretical Framework 2

Review of Selected Literature 3

  Definitions of Key Concepts 8

Objectives 10

Method 11

  Family Environment Measure 11

  Sample 15

  Data Source for Family Environment, Family Socio-Economic Level, Ethnicity, Family Structure, Academic Achievement, Intelligence, and Communication Competence 18

  Procedure 20

Analyses, Results and Discussion 25

  Overview 25

  Note on Data Set 27

  Constructs of the Family Environment 28

  Effect of Differences in Status Characteristics 37

  Relationship of Family Environment and Academic Achievement 39

Page

Relationship of the Constructs of the Family Environment and Academic Achievement 43

Reading Comprehension Results 44

Math Concepts Results 51

Math Computation Results 56

Discussion of Results 63

Reading Comprehension 64

Math Concepts and Math Computation 67

Relationship of Demographic Variables and Academic Achievement 73

Reading Comprehension - Demographic Variables Results 75

Math Concepts - Demographic Variables Results 78

Math Computation - Demographic Variables Results 85

Discussion of Results 88

Relationship of Family Environment and Academic Achievement Compared to the Relationship of Demographic Characteristics and Academic Achievement 94

Family Learning Environments of Hearing Impaired Children Compared to Family Learning Environments of Hearing Children 100

Summary, Conclusions and Implications 107

Summary of Major Findings 107

Conclusions 110

Implications of Research for Practitioners 113

References 116

Appendices

Appendix A: Family Environment of Deaf Children Instrument

Appendix B. Socioeconomic and Demographic Characteristics of Families with Hearing Impaired Children Compared with Those of the Nation's Families

Appendix C. Raters' Manual: Instructions for Rating Communication Competency from Videotaped Families at Dinner

Appendix D. Variable List

Appendix E. Group Stacked Histograms for Three Discriminant Analyses for Family Environment Predicting Academic Achievement

List of Tables

Page

1. Varimax Factor Matrix Derived from Family Environment of Deaf Children Instrument 30

2. Pearson Correlations Between Family Environment and Academic Achievement Across Differences in Status Characteristics 40

3. Reading Group Means, Standard Deviations, and Univariate F-Ratios for Six Family Environment Variables 45

4. Summary of Step-wise Discriminant Function Analysis for Family Environment Factor Scales Predicting High and Low Achievers in Reading Comprehension 47

5. Pooled Reading Comprehension Within-Groups Correlation Matrix for Family Environment Variables 49

6. Math Concepts Group Means, Standard Deviations, and Univariate F-Ratios for Six Family Environment Variables 52

7. Summary of Step-wise Discriminant Function Analysis for Family Environment Factor Scales Predicting High and Low Achievers in Math Concepts 53

8. Pooled Math Concepts Within-Groups Correlation Matrix for Family Environment Variables 55

9. Math Computation Group Means, Standard Deviations, and Univariate F-Ratios for Six Family Environment Variables 57

10. Summary of Step-wise Discriminant Function Analysis for Family Environment Factor Scales Predicting High and Low Achievers in Math Computation 59

11. Pooled Math Computation Within-Groups Correlation Matrix for Family Environment Variables 60

12. Reading Group Means, Standard Deviations, and Univariate F-Ratios for Five Demographic Variables 76

13. Summary of Step-wise Discriminant Function Analysis for Demographic Variables Predicting High and Low Achievers in Reading Comprehension 77

14. Pooled Reading Comprehension Within-Groups Correlation Matrix for Five Demographic Variables 79

15. Math Concepts Group Means, Standard Deviations, and Univariate F-Ratios for Five Demographic Variables 80

Page

16. Summary of Step-wise Discriminant Function Analysis for Demographic Variables Predicting High and Low Achievers in Math Concepts 82

17. Pooled Math Concepts Within-Groups Correlation Matrix for Five Demographic Variables 84

18. Math Computation Group Means, Standard Deviations, and Univariate F-Ratios for Five Demographic Variables 86

19. Summary of Step-wise Discriminant Function Analysis for Demographic Variables Predicting High and Low Achievers in Math Computation 87

20. Pooled Math Computation Within-Groups Correlation Matrix for Five Demographic Variables 89

21. Summary of Indicators of Significance from Discriminant Analyses for Family Environment and Demographic Variables Predicting Academic Achievement 95

22. Rank Order of Discriminant Analysis Solutions by Canonical R^2 and by Hit Rate 97

23. Listing of the Family Environment Constructs Derived for Three Studies 104

List of Figures

Page

1. Centroids of High and Low Academic Achievement Groups in One-Dimensional Space Defined by Three Separate Discriminant Functions 62

Purpose and Rationale

Studies of school learning of the past twenty-five years have demonstrated that the major variable that explains much of the difference in the achievement, interest and attitudes of the students is their home environment. Variation among the teachers, the curricula and the schools is relatively small when compared to the differences among the home environments (Coleman, 1966; Plowden, 1967; Bloom, 1974; Walker, 1976). The purpose of this study of family learning environments for deaf children was to demonstrate the relationship between the deaf child's social-psychological family environment and his/her academic achievement and affective development.

Family environment research that considers both global classificatory variables, such as social status indicators and sex, as well as refined social-psychological measures, such as a parent's aspirations for their child, has provided information on how specific characteristics of the home and family relate to the child's cognitive abilities and affective characteristics. Studies in the area of families as learning environments have, therefore, become more sensitive and valid and hold greater promise of having diagnostic value for the practitioner or policy-maker.

Family environment research of this nature did not exist in the literature on the development of hearing impaired children's cognitive and affective behaviors. It was proposed that the inclusion in the family of a child with early profound hearing impairment is related to a family learning environment for the child unlike that of the hearing child's, and that the deaf child's learning environment is related to differences in the child's cognitive and affective development.

The notion of the impact of early childhood deafness on the family is not new. Fellendorf and Harrow (1970) clearly describe the struggles of hearing parents of deaf children who may be unable to accept the diagnosis and, consequently, suffer great anxiety and sorrow. Meadow and Trybus (1979) go farther--they propose that the prevalence and the nature of emotional/behavioral disturbances observed in deaf children suggest that the impact of deafness on the home environment is significant and creates patterns of parental behaviors detrimental to the child's development.

Theoretical Framework

The theoretical positions constructed by Lewin (1934), Murray (1938) and Bloom (1964) form the conceptual basis for this study. Lewin's work in the area of personality stressed the need to understand behavior (B) as an outcome of the relationship between the person (P) and his/her environment (E), or $B=f(P,E)$. Murray further proposed that an environment has a directional tendency in that it can be classified as harmful or beneficial as it effects the person. Murray's framework is called the press of the environment and has both a qualitative and quantitative aspect. Bloom provided much of the impetus for educational research on family social-psychological environments. He conceptualized and defined the total environment surrounding an individual as being composed of several sub-environments. To understand the development of a particular characteristic of an individual, then, Bloom proposed that the research task was to identify and measure that sub-environment of press variables which potentially is related to the characteristic.

Review of Selected Literature

The family environment research in the educational literature drawing from this theoretical position and having the most bearing on this study is the work done by Marjoribanks (1979) and the earlier research of Dave (1963), Wolf (1964) and Hess, Shipman, Brophy and Bear (1968).

The study of the effects of the home environment on academic achievement by Dave (1963) and on intelligence by Wolf (1964) began with the premise that it is what the parents do rather than their socio-economic status or ethnicity that accounts for these outcomes in their children. On the basis of the literature, Dave hypothesized that the home environment relevant to educational achievement might be studied in terms of the following home environmental variables:

1. Achievement press
2. Language models
3. Academic guidance
4. Activeness of the family
5. Intellectuality in the home
6. Work habits of the family.

These variables were each broken down into specific process characteristics which defined and delineated the variable. Then sets of interview questions were constructed for each characteristic. On a nine point scale, ratings were made on the basis of interview and observational data for each characteristic following specified criteria for evaluation. A list of the variables and their process characteristics follows.

1. Achievement press
    - a. Parental aspirations for the education of the child
    - b. Parents own aspirations
    - c. Parents' interest in academic achievement
    - d. Social press for academic achievement
    - e. Standards of reward for educational attainment
    - f. Knowledge of the educational progress of the child
    - g. Preparation and planning for the attainment of educational goals.
2. Language models
    - a. Quality of the language usage of the parents
    - b. Opportunities for the enlargement and use of vocabulary and sentence patterns
    - c. Keenness of the parents for correct and effective language usage
3. Academic guidance
    - a. Availability of guidance on matters relating to school work
    - b. Quality of guidance on matters relating to school work
    - c. Availability and use of materials and facilities related to school learning
4. Activeness of the family
    - a. The extent and content of the indoor activities of the family
    - b. The extent and content of the outdoor activities during weekends and vacations
    - c. Use of TV and such other media
    - d. Use of books, periodical literature, library and such other facilities

5. Intellectuality in the home
    a. Nature and quality of toys, games, and hobbies made available to the child
    b. Opportunities for thinking and imagination in daily activities
6. Work habits in the family
    a. Degree of structure and routine in the home management
    b. Preference for educational activities over other pleasurable things

When an overall index of the home environment was correlated with the results of a fourth grade battery of achievement tests (Metropolitan) the relationship was found to be very high (+.80). Generally, the correlations were highest with tests of word knowledge and lowest with spelling and arithmetic computation. These results suggest that the home has greatest influence on language development and general ability to learn and least influence on specific skills primarily taught in school such as spelling and computation.

The Dave and Wolf studies have been replicated in a number of other countries and cultural settings with very similar findings (e.g., Dyer, 1967; Kellaghan, 1977; Marjoribanks, 1979). In addition, the research that followed built on their approach and further developed and refined their conception of the environment. Overall, this line of research demonstrated that parents with different levels of education, income or occupational status do provide stimulating home environments which encourage and support the child's learning.

Over the years research on family environment and learning has resulted in increasingly more precise outcomes as it moved beyond using primarily social-economic status indices to represent the home environment. At the same time, however, many of the studies have been limited by restrictions in methodology, e.g., single sex samples, samples from one ethnic group, and statistical techniques. In perhaps the most complete presentation of the major research in family learning environments, Marjoribanks (1979) described the effects of these limitations and reviewed research, including his own extensive work, that has attempted to go beyond these restrictions to achieve more accurate observations of the interactions and characteristics of the family that account for children's academic and cognitive behavior.

Two of Marjoribanks' studies will be summarized here. Wanting to test for possible interaction and curvilinear relations between the variables, Marjoribanks (1979) used a regression model to generate regression surfaces to examine the proposition that family social status is related to children's school-related outcomes at different levels of refined family environment measures. Included in the results of the regression surface analyses was the finding that at each social status level, increases in family environment are associated with sizeable increases in intelligence scores and also English achievement scores; and at each level of family environment, changes in social status are associated with changes in English achievement.

In a path analysis study, Marjoribanks (1979) examined the effects of the family's social-psychological environment on achievement and affective outcomes when measures of social status, previous achievement, intelligence, peer-group orientations, and teacher attitudes are included in the analysis. The dominant variables influencing academic achievement were intelligence, reading and parents' aspirations, with teacher attitudes operating for the younger (7-year-old) group. For the 8 and 11-year-olds, reading was a relatively more important influence on the academic outcome in the girls' samples, while intelligence and parents' aspirations were more important variables for boys than for girls.

Throughout Marjoribanks' analyses it is shown that there exists a complex network of interrelated family environment variables that are associated with children's academic and cognitive performance. Further, the family environment variables which are related to children's school performance are associated also with the psychological or "person" variables of the children: the individual's intelligence, attitudinal and personality characteristics as well as prior academic achievement levels.

Apart from the studies focusing primarily on mother-child interaction represented best by the work of Schlesinger and Meadow (1972) and those investigating segments of the family environment, e.g., Greenberg (1980), there has been virtually no effort to systematically observe the impact of a deaf child on the family. Because of a lack of information about the relationships between deaf children as family members and the family learning environment, explanations of differences found between deaf children with hearing parents and deaf children with deaf parents must be made cautiously (Moores, 1982). For example, the consistent finding that the performance of deaf children with deaf parents is superior to that of deaf children with hearing parents on academic achievement, social development and English language measures (e.g., Meadow, 1968) cannot be explained by the parents' use of sign language. Certainly other factors should be considered as potential predictors of this comparatively superior performance by deaf children with deaf parents: the reduction of the traumatic reaction to deafness that effects the parents' relationship to the child, and the likelihood that these parents interact with their deaf child in ways consistent with behavior of parents of normally hearing children.

Family environment research examining the relationship between social-psychological family environment variables, social status indicators, family structure variables and childrens' school and affective behavior holds promise as a model for the study of deaf children and their families and fills a void regarding how we might conceptualize the effects of the handicapping condition on the development of the deaf child. On the basis of the literature, it was suggested that the social-psychological environment measure for deaf children should include a variable, thus, process characteristics for parents' integration of "hearing impairment" into the home. The thrust of this theoretical framework is toward conceptualizing the state of early profound hearing impairment as a discrete array of experiences--interactions between person and environment--and patterns of experiences that can be examined in relation to the effects they have on the deaf child's behavior.

Definitions of Key Concepts

Environment:

The conditions, processes and external stimuli that impinge on the individual and interact with him/her. This definition is derived from the meaning of the environment as conceived by Bloom (1964) and discussed earlier. The concept of the environment in this study includes living beings as well as physical objects and occurrences. The environment's boundaries are determined by the extent of active interaction between the person and the outside world.

Family learning environment:

Those conditions, forces, processes and social-psychological stimuli of the total environment in the home which affect the academic achievement of the child. While the learning environment may be present in the school, in the classroom, in the home and also in the community, the home produces the first, and probably most insistent and subtle influence on the child. This study focused entirely on the home. The learning environment (perhaps it could be described as the "academic achievement" environment) in the home was considered as a specific sub-component of the total environment in the home.

Academic achievement:

The child's performance on the different academic subjects in the school. The performance is generally estimated by a suitable battery of standardized achievement tests--to insure uniformity and reliability. The academic achievement is considered an index of the child's educational behavior.

Environmental process variables and process characteristics:

As discussed earlier, the learning environment in the home is described in terms of the specific processes, interactions and forces, and not social status characteristics. These are called the environmental process variables. They are obtained from the theoretical and research literature on learning, child development, the education of the deaf and other pertinent areas. Each process variable is then further defined and delineated in terms of process characteristics in order to make them more operational.

Objectives

The overall intended outcome of this research was to be able to identify and describe systematic occurrences in families with deaf children which have a significant impact on the child's school learning and development. The results of the study will enable professionals working with parents to translate into specific, practical applications the heretofore unspecified, knowledge that specific family characteristics are significant contributing variables in a child's life.

The study had five primary objectives:

1. To examine the relationship between family environment and academic achievement given differences in family socio-economic level, I.Q., family size, ordinal position, sex, communication mode used in school and type of student.
2. To assess the relationship between family environment of hearing impaired children and academic achievement.
3. To assess the relationship between status characteristics and academic achievement of hearing impaired children.
4. To compare the relationship between family environment and academic achievement with the relationship between status characteristics and academic achievement.
5. To compare the family learning environment of families with hearing impaired children with the family learning environment of families with hearing children.

Method

Family Environment Measure

The research project described in this report was preceded by a preliminary preparation phase during which Marjoribanks' Family Environment Interview Instrument was adapted and pilot tested along with the interviewing protocol. The environment measure was in the form of a semistructured home interview schedule and elicited responses from parents; for most items a set of alternate responses was supplied by the interviewer. In addition, an "other answer" was provided so the interviewer could record any response and/or comments the parents made. The schedule obtained a measure of the intensity of the present environment operating in the family and attempted to gain a measure of the cumulative nature of the environment. For example, as well as asking "how much education do you expect your child to receive?" the schedule also included a question to estimate how long the expectations had been held. The adapted instrument used in this study is contained in Appendix A of this report.

Marjoribanks' family environment variables, which this study prefers to refer to as "dimensions" of the family environment, the process characteristics and interview items were based on those developed by Dave (1963), and others, e.g., Walberg & Marjoribanks (1973). Thus, the interview instrument used in this study closely followed the conceptualizations of this earlier research but was adjusted for use in this study to accommodate a population from the United States and a family situation which included a hearing impaired child and possibly hearing impaired parents. The schedule was expanded to include an additional environment variable (dimension) called, parental integration of hearing impairment into the family environment. Other adaptations included: the addition of general information items such as type of school program placement and schooling history, age of diagnosis of the hearing loss, communication competence and mode of communication and the use and effectiveness of the child's hearing aid(s).

This study's additional dimension, parental integration of hearing impairment into the family environment, was developed following the general procedure Dave (1963), Wolf (1964), Marjoribanks (1979) and others used for the development of their environment measures. The procedure for defining and delineating a dimension into its characteristics was discussed earlier (Bloom, 1964; Dave, 1963). The parental integration of hearing impairment dimension and the characteristics that comprise it are listed below. Interview questions were constructed for each characteristic.

Parental Integration of Hearing Impairment into the Family Environment

a. "Adaptive" reaction to hearing impairment
b. Knowledge of child's hearing loss and development of hearing
c. Keen parental interest in communicating with the deaf child
d. Keen parental interest in the deaf community
e. Emphasis on parity in child-rearing orientation regarding supervision and discipline

The family environment dimensions, called variables by Dave (1963), and Marjoribanks (1979), and their descriptive characteristics used to develop an instrument to generate data in this study for the analysis of the deaf child's family learning environment are listed below. It should be noted that these were hypothesized dimensions used to define the family environment. Six of these were based on earlier learning environment research; the seventh dimension was constructed to reflect the presence of a deaf child in the home. The family learning environments of deaf children have not been measured prior to this study.

1. Parents' aspirations for the child
    a. Knowledge of the child's current school work and activities
    b. Standards and expectations for the child's school work
    c. Educational and occupational level aspirations and expectations for the child
2. Parents' aspirations for themselves
    a. Educational level of close friends and relatives
    b. Occupation level of parents' father
    c. Occupation level of parents
    d. Parents' job satisfaction
3. Concern for the use of language
    a. Family use and discussion of books and magazines
    b. Family concern and help for correct and effective language use
    c. Opportunities for enlargement of vocabulary and sentence patterns
    d. Interaction with other adults and child
4. Parents' reinforcement of aspirations
    a. Extent and nature of recreational activities parents and child do together
    b. Expectations and encouragement of the child's school work
    c. Preparation and planning for the child's higher education

5. Knowledge of child's educational progress
    a. Parental knowledge of school subjects' content and strengths and weaknesses in the child's school progress
    b. Frequency parents discuss child's progress in school
6. Family involvement in educational activities
    a. Sibling interactions involving a teaching-learning orientation
    b. Parent involvement in child's hobbies
    c. Parent-child interactions with reference-type books at home
    d. Extent and nature of educational activities parents and child do together
    e. Frequency family plans and goes on weekend outings
    f. Parents' involvement in courses outside the home
    g. Child's involvement in lessons outside of school
    h. Child's activities after school and after dinner
    i. Extent and nature of child's TV viewing with parent discussion
7. Parental integration of hearing impairment into the family environment
    a. "Adaptive" reaction to hearing impairment
    b. Knowledge of child's hearing loss and development of hearing
    c. Keen parental interest in communicating with the hearing impaired child
    d. Keen parental interest in the hearing impaired community/culture
    e. Emphasis on parity in child-rearing orientation re: supervision and discipline

Sample

A large number of families with deaf children were required for this research in order to provide sufficient power when using multivariate statistical techniques. This report will present research results based on 124 interviews with 119 families who have children who are severely to profoundly deaf.[1] The families were located in seven states in the northeastern region of the United States and in the District of Columbia.

The following criteria were followed in selecting families to participate in this study: the child's hearing level was to be no better than 80 or 70 dB average in the speech range in the better ear; age at onset of the hearing loss was to be no later than 18 months of age; there were to be no known additional handicapping conditions, and the age range of the children was to be 10 to 12 years.

Of the 124 study children, 70 (56.5%) were males and 54 (43.5%) were females; their ages ranged from 9.4 years to 13 years, with a mean of 11.5 and a standard deviation of 9.8. Twenty-two or nearly 18% of the children had two deaf parents. This percentage far surpasses the U.S. figures for the 1978-79 school year: 2.6% of the deaf students had two deaf parents (Karchmer, et.al., 1981). Of the children with deaf parents, approximately 40% (N=9) were boys and 60% (N=13) girls while the reverse was true for the deaf children with hearing parents approximately 60% of whom were boys and the rest girls. Ninety-seven or 78.2% of the children had hearing parents and five children had at least one parent who was hard of hearing.

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[1] Five families had two study children and were interviewed twice.

Although a majority (78.2%) of the families who were interviewed were white, nearly 22% (N=27) belonged to minority racial/ethnic groups including Afro-American (black), Spanish-American, Eastern Indian, and Haitian. This is slightly above the national estimate of 18.5% minority membership in the general population. Nineteen of the minority children in this study were black and all had hearing parents. All 22 children with deaf parents were white as were the 70 children with hearing parents and the five children with hard of hearing parents.

Of the study children, approximately 82% had entered some type of school program before or at age three years. At the time of the study, half of the children were enrolled in a residential school for the deaf although only 34% of the children were residential students. The next largest group of children, 40 in all, attended a day school for the deaf. The remaining 22 children attended a program for normally hearing students and were either in a special self-contained classroom and/or mainstreamed with hearing children to some degree. Although over 82% of the children were in special school programs for the deaf, only approximately 77% of the children had a totally segregated school day. The rest, 29 children (23.4%), were mainstreamed for P.E., lunch, recess, and/or some academic subjects (N=14), or for most all academic subjects (N=15).

Over 82% of the children spent most of their school day with hearing teachers; approximately 12% or 15 children spent their days with both deaf and hearing teachers and seven families reported they did not know if their child's teacher was deaf or hearing.

Sixty-nine percent of all the study children came from intact families. Of the families with deaf parents, a relatively high rate of 82% were intact, while 66% of the deaf children with the hearing parents came from intact family structures, a percentage which is closer to the national average. Close to 14% of the study children had no siblings and none had more than seven. The mean family size was 2.7 children, SD=1.3. Ninety-three (75%) of the study children were first born, 13 were second born and 12 were third. There were three fourth born study children and one each at the fifth, sixth and seventh ordinal position. The mothers' ages were in the range of 27 to 60 years, M=37.5, SD=6.3; and the father's ages ranged from 26 to 57; M=40.6, SD-5.5.

The data on child's primary mode of communication at home and at school may be of particular interest. Approximately 73% of the 124 children used a simultaneous (oral and manually coded English) mode of communication at school. Of those, 38% came from homes where simultaneous communication was generally used, 51% came from oral homes and the remaining families reported using primarily manual. Of the 27% who used an oral mode of communication in school, a surprising 18% were in a simultaneous communication home environment.

The father's occupational level ranged from jobs requiring the highest education level, e.g., Ph.D., M.D. (scale value = 1) to jobs requiring little or elementary school education level (scale value = 5). On a scale of 1 to 5, the mean father occupation was 3.1, SD=1.1, jobs requiring high school plus some college or training. Only one father was not employed. Sixty-five percent of the mothers had occupations other than housewife. The range of their occupational level was like the fathers', however, their mean of 4.2, SD=1.5 (job requiring high school degree or some high school) meant more mothers than fathers were employed in jobs requiring less formal education and training.

Family SES levels in this study ranged from a high of 1 (jobs requiring highest educational level) to a low of 5 (jobs requiring little or elementary school), with a mean of 3.66, SD=1.54. Fifty-four percent of the families were in the first, second and third SES levels.

Appendix B contains a comparison of this study's sample and the nation's families based on socio-economic and demographic characteristics.

Data Source for Family Learning Environment, Family Socio-Economic Level, Ethnicity, Family Structure, Academic Achievement, Intelligence, and Communication Competence

Family Environment

Family environment data consist of mother and father responses to interview items rated on scales generated to measure each of the family environment dimensions. An Index (score) of the Family Environment for each child was obtained by summing the scores/ratings on the items that made up each of the six factors resulting from the factor analysis. The scoring system was such that a low score indicated a "favorable" environment whereas a high score on the Index reflected an "unfavorable" environment.

Family Socio-Economic Level

Family socio-economic level was scored on Marjoribanks' five-step scale of occupation-by-requisite-education as reported by the parents during the interview (High=1; Low=5). If both parents worked, the higher-level occupation was used to score family SES. Occupation was chosen as the primary index of SES because Hollingshead (1957) found occupation to be the best single index of his highly detailed social class stratification. In addition, occupation is more likely to be reported in a uniformly scaleable manner and occupation level is more likely to have a stable meaning in terms of SES than are income or education, for which levels have been changing drastically over time and region.

Ethnicity

Ethnicity is indicated by race in this study and the data were obtained by observation during the home visit for conducting the interview.

Family Structure

Family structure is indicated by ordinal position of the study child and by the number of children in the family. These data were obtained by parent responses to relevant questions during the interview.

Academic Achievement

Academic achievement was obtained from each child's school records. For this study, percentile scores for reading comprehension, math concepts and math computation comprise the academic achievement data. Over 84% of the academic achievement data received derive from the SAT-HI (Special Edition for Hearing Impaired Students). Other tests used were the California Achievement Test and the Metropolitan.

Intelligence

Intelligence data were also obtained from the child's school records. The majority (92%) of the I.Q. scores received derive from the WISC-R.

Communication Competence

Communication competence was determined from responses obtained during the interview on questions to the parents regarding how they would rate the level of understanding in the home in the communication process between child and mother, child and father, and child and siblings and/or others. For a sub-sample, videotaped observations were made of family interaction during dinner in order to obtain a global rating of understanding between family members during communication.

Procedure

The sample of families who participated in this study was identified and obtained through the cooperation of the school programs the children attended. The schools were selected on the basis of expected number of children that met criteria and to assure adequate representation on a number of characteristics: type of school program, i.e., oral versus total communication, residential versus day, mainstreamed versus segregated program; type of student, i.e., commuter versus residential, deaf versus hearing parents and demographics. In addition, budget constraints regarding travel distance from Washington, D.C. were considered. While care was given to representativeness, the sample was not randomly selected and the usual precaution regarding generalizations should be heeded.

Since the interview data were to be related to school record data the schools' cooperation was necessary. The superintendent or head of each program was contacted by letter explaining the research and requesting the schools' participation. This was followed-up by a phone call from the project director. Specifically, the school was requested to release to the project director the names, addresses and phone numbers of the families whose children met criteria. In almost all cases when the school was interested in the study, they first contacted the parents, gave them a brief explanation of the project and requested permission to release their names and other information to the project. The project then contacted the parents by phone and asked them to participate. This also provided an opportunity for the parents to ask questions about the project. Essentially, they were informed that the focus of the study was on family-school relationships and on how the family impacts on the child's learning. Only one family that was called declined to be interviewed. The schools also required the project to receive parental permission to release their child's I.Q., academic achievement and social-emotional data from the schools' records. In the event the child did not have the particular social-emotional information required, the parents were requested to permit it be gathered and then released.

The parents were interviewed in their homes[2] by a trained interviewer using an adaptation of the Family Environment Interview Schedule developed by Marjoribanks (1979). Each family was visited at a prearranged time. After establishing rapport, the interviewer proceeded with the semi-structured interview. The length of time of the interviews ranged from 50 minutes to four hours per child, with a mean and mode time of approximately two hours. Care was taken to provide a focused but open-to-discussion atmosphere to the families during the interview. Interviewing took place from November, 1981 through September, 1982.

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[2] In two cases, the interviews were started in the home and completed over the telephone.

Communication competency was considered to be a potentially significant characteristic of the family environment. Care was taken, therefore, to obtain reliable communication competency data. Parents were asked interview questions about these characteristics. Additionally, in an effort to validate the parent report data concerning communication competency between the deaf child and his/her family members, videotaped observations were made of family interaction of a sub-sample (N=19) of the study families.

In order to capture a sample of "natural" family interaction, family dinner time was chosen as the framework for the videotaped sessions. Also, it is a daily occurrence when most family members are likely to be home. The videotaped dinner sessions took as long as the family's meal but no longer than one hour. The video technician with an aide arrived at a pre-arranged time, set up the equipment, instructed the mother or father how to turn the recorder off when they finished eating, turned it on when the family was ready, and then left. The families were asked to call in the "crew" when their meal was complete and were invited to view the tape. Caution was taken to avoid intrusiveness of the equipment as much as possible, e.g., lighting equipment was kept to a minimum. Families were asked to try to go about their normal business as if the camera was not there. It was believed that the use of videotape rather than trained observers minimized intrusiveness while making it possible to observe virtually all interactions between family members be it eye contact or an outright verbal harangue. Indeed, it appeared that after a few moments the presence of the machinery was almost forgotten. Although an elevation of behavior may have occurred, the actual quality of the interaction probably did not change.

The 22 children (19 families--three families had two study children) that made up the sub-group for verification of communication competency parent report data with video-observation expert rating data had the following characteristics: in five of the 19 families, both parents were deaf; 13 of the children were boys, nine were girls; all but two families were white, three of the families were single parents (mothers), family members present for the observation which, for the most part, corresponded to actual family size ranged from two to five, with a mean of 3.63.

Results of communication competence validation: Parents' communication competence with the child was measured by a self-assessment item (Part A, #44) within the interview. Validity of the self-assessment was subsequently examined, with disappointing results, using a sub-sample of 22 children from 19 families. Each family in the sub-sample was videotaped and their communication was measured by a panel of experts over a number of variables. The "Raters' Manual: Instructions for Rating Communication Competency from Videotaped Families at Dinner" is in Appendix C.

One of these communication variables, "level/amount of mutual understanding," (R1) was correlated with parent self-assessment using Kendall's Tau. It was felt that observations and ratings on variables 1-13 were prerequisite to rating the reciprocal understanding. The correlation showed that mothers' self-assessments were virtually uncorrelated with expert ratings (Tau=.04), while fathers' self-assessments and expert ratings were weakly correlated (Tau=.20).

Since the communication self-assessment was not successfully validated it will not be used in further analyses for this report. However, two conditions strongly suggest its potential and reasons for reintroducing it in subsequent analysis of these data. First, Kendall's Tau is not a robust measure, that is, it is highly susceptible to the influence of outliers. With a sample of this size two or three aberrant cases are sufficient to discredit the entire procedure. Second, judgments by the panel of experts were made on several communication variables. Others of these, either singly or in combination, may be more closely related to the parent self-assessment than R1 was.

In summary, while parent self-assessment of communication competence will not be used in this report it has not been ruled out as a useful and critical measure. Analysis of the communication competency data will be explored further and will be subsequently reported elsewhere.

Analyses, Results and Discussion

Overview

The findings will be presented in this section addressing the following questions which relate to the primary objectives of this study as described previously in this report:

1. What are the underlying constructs of the family environment? The results of data reduction procedures will refine the data (over 400 variables) gathered in the family interviews to a set of factors (constructs) which describe the most salient family environment characteristics that represent the family environment.

2. What is the effect of differences in family socio-economic levels, sex, ordinal position, family size, I.Q., type of student and communication mode in school on the strength of the relationship between the family environment and academic achievement? Certain demographic characteristics have been shown to relate to academic achievement and to family environment. The relationship of environment and achievement in this study is expected to be differentially effected by differences in levels of status characteristics.

3. Which underlying constructs of the family environment best predict the academic achievement of hearing impaired children? This study proposed that the family environment is comprised of a number of factors, i.e., a sub-environment, which influence the hearing impaired child's school learning.

4. Which demographic classification variables best predict the academic achievement of hearing impaired children? Previous research has demonstrated the relationship between various status characteristics and a hearing child's

school learning. Hence, it seems reasonable to expect the hearing impaired child's academic achievement to be similarly influenced.

5. Which set of variables: family environment characteristics or demographic characteristics, is the better predictor of the academic achievement of hearing impaired children? It is argued here that not only will the set of family environment characteristics more successfully (statistically) predict academic achievement than will demographic characteristics but that the combined family environment and demographic characteristics will result in substantially more meaningful and utilitarian findings offering greater explanatory power. These results will have major theoretical and practical significance for understanding variation in the deaf child's school-related learning.

6. Do family learning environments of hearing impaired children differ from family learning environments of hearing children? There was the expectation that differences would exist since the inclusion of the hearing impaired child in the family results in experiences, opportunities, beliefs and interactions not found in families with only hearing children. Families with hearing children have as their frame of reference for behavior families and children without hearing impairment. In most families with hearing impaired children this frame of reference, which influences parental expectations for the child, child-rearing orientations and parent-child interactions, is often no longer drawn on as a directing resource.

Note on Data Set

The data set on which the majority of the analyses were performed comprised family unit responses. This means that for family units consisting of single-parent families, the responses used are those of the single mother or single father head of family. In the family unit in which there was both a mother and father living, the responses used are the mothers. Thus, for those questions to which mothers and fathers responded, only the mothers data have been used in most cases (FAMSES is one exception). It could be argued that the mother's influence on the family is the more salient and the research seeking to derive the most advantageous influence on the child would ultimately use the mother data anyway. That is purely hypothetical at this time, however, and the reader is cautioned about the maternal bias on those questions where it is pertinent.

1. What are the underlying constructs of the family environment?

The theoretical and research bases from which the objectives of this study were formulated involve first, the derivation and second, the analysis of underlying constructs in the family environment as they relate to the child's academic performance. The next several pages describe the first step, the derivation of constructs of the family environment.

Constructs of the Family Environment

Factor analysis was performed on approximately 100 selected interview instrument items to derive the underlying constructs or the factor structures of the family environment. One-hundred items is the SPSS sub-program FACTOR limit for variable entry.

The family environment interview questionnaire contained some 300 items. The questionnaire was designed with sets of items so that the items in each set were highly related to each other conceptually. These conceptualizations were based on those of Dave (1963) and Marjoribanks (1979). Therefore, the task of paring down the 300 items to 100 in order to perform the factor analysis involved selecting the best representative item from each set. Treating these 100 items as 100 variables, factor analytic techniques enabled the researcher to detect any underlying pattern of relationships among the variables, such that the data could be reduced to a smaller set of factors which account for the observed interrelations in the data. This factor analysis is exploratory in the sense that it included the "deafness-related" variables and others considered by the researcher to reflect unique family environment characteristics due to the deafness. This resulted in the structuring of variables and the development of new constructs unlike those of Dave (1963), Marjoribanks (1979) and others.

The factor analysis was carried out using an SPSS program which derived principal components with iterations (PA2) and orthogonal varimax rotation. First, an unreduced factor solution was conducted for 4, 5, 6, 7 and 8 factors. These results, when combined with pattern and structure matrix analysis, led to the deletion of 36 items/variables. Ultimately, a reduced factor solution taken over 64 variables and 124 families was retained as the theoretically strongest and most meaningful for interpretation purposes. This analysis produced six factors with eigenvalues > 2.0 and accounted for 45% of the common and specific variance. Factor loadings of $>.30$ were accepted. Table 1 displays the factor matrix of the reduced six factor terminal solution. The factors were named: Concern for School Progress and the Use and Development of Language and Communication, Parental Aspirations and Expectations for Child's Academic and Occupational Achievements, Integration of Hearing Impairment into the Family Environment, Parents' Satisfaction with Child's Schooling, Parents' Aspirations for Work and Leisure, Child-Rearing Orientation. The variable list of 64 variables is in Appendix D.

The following discussion describes and interprets the variable clusters that emerged from the rotated factor matrix. The variables having relatively higher loadings on a given factor cluster under that factor and comprise a hypothetical construct. Each of the six hypothetical constructs or factors were named on the basis of the common elements underlying the content of all or a majority of the variables determined by the given factor.

Table 1

Varimax Factor Matrix Derived from Family Environment of Deaf Children Instrument

Item No.	Factor Number and Loadings*					
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
VAR230	0.44466	0.29845	-0.02311	0.10981	0.32325	0.39476
VAR164	0.17267	0.52473	0.05095	0.09865	0.07403	0.00215
VAR170	-0.06762	0.39633	0.19613	0.17811	0.01252	-0.04479
VAR200	0.03264	0.34112	-0.16037	-0.10021	0.19024	0.14580
VAR201	-0.03547	-0.02531	0.19909	0.00334	0.04433	-0.16868
VAR204	0.03628	0.54231	0.12832	0.05344	0.20849	0.08830
VAR205	0.59949	0.27766	-0.22254	0.09311	-0.03269	0.17689
VAR209	[illegible]	0.25916	-0.03230	0.00716	0.08765	0.36012
VAR210	0.04492	0.21325	0.00835	-0.04741	0.36397	0.10726
VAR211	[illegible]	0.33315	0.23620	0.09080	0.04686	0.49727
VAR213	0.01771	0.42593	0.07710	-0.04214	0.15163	0.15251
VAR231	0.16542	0.43693	0.05231	0.01268	-0.03300	-0.14255
VAR232	0.23400	0.44525	0.04275	-0.00976	0.00091	-0.12645
VAR234	[illegible]	0.42517	0.11435	-0.06466	0.14776	0.05182
VAR241	0.55525	0.13185	-0.02573	-0.05697	0.19453	0.10163
VAR242	0.53255	0.36451	0.02346	-0.07290	0.00264	-0.00533
VAR276	0.45236	0.25165	0.20747	-0.04878	0.05752	0.30961
VAR238	0.22111	-0.10045	-0.39634	0.09576	-0.04212	0.11649
VAR243	0.34031	0.19847	0.00293	-0.02755	0.32251	0.28939
VAR247	0.35020	0.14926	0.09520	-0.07025	0.30387	0.40640
VAR254	0.44284	-0.10924	0.01737	0.03491	0.02167	0.35421
VAR262	0.21169	0.02812	0.21474	0.02140	-0.01192	0.37047
VAR251	0.13047	0.17126	-0.05252	0.01576	0.12327	0.14575
VAR266	0.12361	-0.22341	0.03730	-0.06708	0.12712	0.37439
VAR268	0.14395	-0.09729	0.35842	0.02479	-0.00931	-0.02000
VAR271	0.04194	-0.07526	-0.03821	-0.10253	0.00540	0.36950
VAR288	[illegible]	0.16517	0.49364	0.12264	0.22396	0.09819
VAR289	0.69463	0.04961	0.01209	-0.09212	0.35215	0.01931
VAR290	[illegible]	0.14165	-0.33224	-0.01649	0.30396	0.12439
VAR291	0.53671	0.14746	-0.07776	-0.17120	0.18486	0.12019
VAR293	0.56247	0.11203	-0.03949	-0.01660	-0.07461	0.43968
VAR294	0.57400	0.25119	0.13300	-0.03345	-0.12839	0.01793
VAR295	0.46214	0.05083	0.24005	0.01723	0.02807	0.13154
VAR297	-0.06749	0.19694	0.51862	0.19294	-0.21620	-0.01732
VAR298	0.46660	0.17976	0.13605	0.13189	-0.05072	0.38960
VAR299	0.55394	0.11025	0.07342	0.02790	-0.21232	0.13877
VAR300	0.59051	0.18047	0.03499	0.09054	0.25223	0.24131
VAR301	-0.02957	-0.32342	-0.29045	-0.11493	-0.10057	-0.02522
VAR305	[illegible]	0.20018	0.46893	0.07980	0.02895	0.16641
VAR307	0.19369	-0.01471	0.34406	0.31588	-0.01193	0.12369
VAR311	0.07214	0.10946	0.13716	-0.00132	0.43437	0.30133
VAR42	0.04246	-0.09504	-0.10073	-0.44595	-0.09311	-0.00277
VAR43	-0.06663	-0.17503	-0.01371	0.60086	0.23634	0.08846
VAR46	-0.24237	-0.02690	0.01922	0.41270	-0.00939	-0.10245
VAR47	0.16441	-0.27400	0.09247	0.43655	0.19665	-0.11631
VAR48	0.19623	-0.39825	0.12376	0.26934	0.13857	-0.19662
VAR49	0.18336	-0.21600	-0.09320	-0.60248	0.14408	0.08415
VAR50	-0.00004	-0.24855	-0.11831	-0.64389	0.06003	0.09177
VAR51	0.11580	-0.13502	-0.03844	-0.63692	0.05521	-0.02586
VAR53	0.32582	0.21150	-0.25656	-0.03497	-0.07350	0.13172
VAR56	0.10902	-0.01528	-0.02924	0.52342	-0.05776	-0.05303
VAR56	0.15222	0.35132	-0.08565	0.02252	0.11056	0.00062
VAR57	0.13701	-0.12239	0.12258	0.43712	0.06669	0.16668
VAR259	0.07347	0.34793	0.01971	-0.00545	0.02805	0.02186
VAR260	0.42063	0.27842	0.17162	0.02397	-0.11325	-0.06882
VAR165	0.22177	0.61356	0.06861	0.02132	0.14850	0.00122
VAR167	0.21423	0.52811	0.01223	0.16030	-0.07058	0.01467
VAR173	0.29246	0.16944	0.06076	0.02931	0.58517	-0.26273
VAR174	-0.04723	-0.01020	-0.06241	0.15604	0.65396	-0.08741
VAR185	0.43918	0.19071	-0.03094	0.10913	0.17865	0.08067
VAR186	0.23887	-0.08952	-0.72899	-0.01511	0.10154	-0.13821
VAR187	0.17700	0.03370	-0.77315	0.02730	0.01073	-0.02936
VAR188	0.65437	0.17878	-0.20079	-0.01435	-0.09475	0.04698
VAR189	0.52024	-0.15055	-0.02931	-0.04424	0.24064	-0.14603
VAR237	0.21370	0.41222	-0.10466	-0.17553	0.03256	0.01605
VAR266	0.19256	0.09848	0.53914	0.17129	0.09425	-0.07824

* Minimum factor loadings accepted = .30; N=124

Factor 1: Concern for School Progress and the Use and Development of Language and Communication (SCHLANCOM)

VAR 230	Extent and content of recreational activities of parents and child
VAR 205	Frequency parents help child with English grammar
VAR 209	Frequency parents introduce child to a new word and/or sign
VAR 241	Parents' knowledge of content of child's school studies
VAR 242	Parents' knowledge of the child's grades/progress in school studies
VAR 276	Frequency parents discuss child's progress at school
VAR 243	Encyclopedias in home and parents discuss them with child
VAR 254	Parent involvement in child's sporting activities
VAR 289	Parents' knowledge of level and nature of child's hearing loss
VAR 290	Parents' knowledge of type, function, and appropriateness of child's hearing aid
VAR 291	Parents' knowledge of content of child's speech and auditory training
VAR 293	Frequency parents discuss child's progress in speech and auditory training
VAR 294	Frequency parents meet with teacher to discuss child's progress in speech and auditory training
VAR 295	Parents learned to sign relative to when the need became apparent
VAR 298	Frequency parents discuss child's general communication (receptive and expressive language) progress (oral or manual).
VAR 299	Frequency parents meet with teacher to discuss child's communication progress
VAR 300	Parents' knowledge of child's general communication abilities
VAR 53	Parents' belief regarding child's time spent on special courses for deaf children
VAR 260	Child's activities after evening meal
VAR 185	Frequency parents give child articles from newspaper or magazines
VAR 188	Keenness of parents for correct and effective language usage
VAR 189	Quality of language usage of the parents

As they are presented here, variables 230 through 254 and variables 260 and 185 indicate parental knowledge of and concern for school, language and communication related activities. Parental encouragement of the development of the child's language skills (205, 209, 188) and of the child's taking notice of items of interest in newspapers and magazines (185) are specific aspects of this construct. The deafness-related variables, as they are listed above, 289 to 53, along with 189 relate to the parents' interest in knowing about their child's hearing loss which, it is reasonable to expect, motivates the parents to get involved with the disability that emerges from that hearing loss, i.e., the child's communication skills and progress. A parental language model for the deaf child press appears to be present in this construct in that both the parents' sign language learning variable (295) and their quality of English usage (189) load on this factor.

The name of this construct suggested on the basis of these variables refers to an underlying dimension of parental knowledge and concern for the child's school progress while, simultaneously, there is a developed knowledge and involvement in dealing with the effects of the hearing loss. Perhaps these two concepts are the counterparts of each other; that is, if there exists the first, there is more likelihood of the second developing.

Factor 2: Parental Aspirations and Expectations for Child's Academic and Occupational Achievements (PASPACOC)

VAR 164	Parental aspirations for child's education-level achievement
VAR 170	Parents' expectations or standard for child's current grades
VAR 200	Child reads to parents in any communication mode
VAR 204	Extent child reads books on his/her own
VAR 213	Child brings books home to read from library, school or friend
VAR 231, & 232	Parents expect child to spend a regular amount of time daily doing homework outside of school
VAR 234	Parental preparation and planning for the attainment of child's educational goals
VAR 301	Extent of parents' participation in deaf community
VAR 56	Parental belief regarding how well deaf and hearing children mix in school
VAR 48	Parents' belief that the child's school curriculum should include more mathematics
VAR 259	Child's activities after school
VAR 165	Parental expectations for child's education-level achievement
VAR 167	Parental aspirations for child's occupation-level achievement
VAR 237	Frequency parents praise or congratulate child

This construct seems to have a more specific and focused influence on the variables than does Factor 1. Variables 164, 165, 167, 170, 234, 231, 232, 237, 48, over half the variables loading on Factor 2, appear to be determined by a press for achievement existing in the family. Parents hope for, plan, and expect certain levels of educational and job attainment; standards for homework and grades are articulated and reinforced. This construct more than any seems to reflect the parents' future orientation and academic insight. Integrated with the parents' future orientation is their interest in the deaf community (VAR 301) in which their child will soon participate while at the same time recognizing the need for the deaf child to associate with hearing children (VAR 56).

A complement to the achievement press is the child's activities during unscheduled time and his/her specific reading habits. In each of these variables (200, 204, 213, 259) the child's internalized motivation for achievement is implied.

Factor 3: Integration of Hearing Impairment into the Family Environment (INTHI)

VAR 268	At what age parents expect/allow child to go around the neighborhood to play where he/she wants
VAR 286	Parents' beliefs regarding their adaptation to their child's deafness
VAR 288	Parents' manner of adapting to child's deafness
VAR 297	Parents' activities related to learning sign language
VAR 305	Frequency parents discuss deaf community
VAR 307	Parental belief regarding supervision needs of deaf children
VAR 186	Extent of parents' English usage in the home
VAR 187	Extent of child's English usage in the home

This construct seems to reflect the parents' level and manner of adapting to the child's hearing loss: variables 286 and 288. It is further suggested that the extent of the adaptation manifests itself in variables 305 and 297: interest in the deaf community and additional activities involving the learning of sign language. These are very complementary concepts within this construct.

Variables 268 and 307 also fall within the "conceptual space" of this construct and again seem to indicate the extent of the parents' integration of hearing impairment into the family environment. It is suggested that parental supervision beliefs and the age at which parents allow their deaf child out into the neighborhood--and this usually means on his/her bicycle--coincides with and perhaps signals the adaptive behavior dimension and is conceptually very much determined by the integration of hearing impairment factor. Variables 186 and 187 indicate an exposure in the home to the English language whether orally or simultaneously communicated. How these relate to this factor construct is difficult to interpret; perhaps later analyses will shed light on their inclusion here.

Factor 4: Parents' Satisfaction with Child's Schooling (SATSCHOL)

VAR 42	Parental satisfaction with child's school
VAR 43	Parental belief regarding amount of homework
VAR 46	Parental belief regarding amount of art, music and drama
VAR 47	Parental belief regarding amount of reading instruction
VAR 49	Parental belief regarding teacher's friendliness
VAR 50	Parental belief regarding teacher's fairness
VAR 51	Parental belief regarding teacher's interest in child's education
VAR 54	Parental belief regarding their welcomeness in the school
VAR 57	Parental belief regarding the amount of information they receive about the child's school progress

Conceptually, this construct may be the least complex of all six. All the variables indicate the parents' level of satisfaction with various aspects of the school curriculum. It should be noted, however, that parents' satisfaction with child's schooling includes parents' beliefs specifically about the teacher's friendliness, interest, and fairness rather than teaching methods or knowledge. Perhaps this more academic concern is accounted for in other variables in the factor analysis. Also, of interest, parental satisfaction here is interpreted as feeling welcome in the school and well-informed of the child's progress.

Factor 5: Parents' Aspirations for Work and Leisure (PASPWORKLEIS)

VAR 210	Extent parents read books
VAR 261	Parents' discussion with child of TV programs
VAR 173	Parents' jobs
VAR 174	Whether parents wish to change jobs
VAR 311	Parental belief regarding the need to explain discipline rules and techniques

This construct appears to be marginally interpretable at this time. The factor label suggests that an underlying determinant of the variables is a balance of parental job satisfaction and the nature and extent of their leisure events. This construct seems to influence primarily parents' and not the child's motivations regarding selected activities. When the child is involved (261, 311), it appears the child is less significant than the parents' interaction with the activity or their perceptions.

Factor 6: Child-Rearing Orientation (CRORIEN)

VAR 211	Parents read to child at early age before preschool
VAR 247	Extent and content of educational activities parents and child engage in together
VAR 262	Time child watches TV on weekends
VAR 266	At what age parents expect/allow child to earn spending money
VAR 271	At what age parents expect/allow child to make certain decisions

While Factor 6 is labeled as an orientation to child-rearing construct it is interpreted as including a press for independence and a press for parent-child interaction regarding intellectually stimulating activities. All the variables in Factor 6 reflect parental beliefs, customs and rules for raising their children. A press for independence, it is suggested, influences the particular parent response in variables 262, 266, and 271, while a press for parent-child interaction in intellectually stimulating events, it is believed, influences variables 211 and 247.

The results of the factor analysis point out for the most part the strengths of the conceptual approach applied in this study in developing a measure of the family learning environments of deaf children. This was shown most clearly by the conceptual cohesiveness found after factor analysis among most of the items identified from the theoretical and research literature and selected to measure the constructs underlying the hypothesized learning environment dimensions. In addition, the unambiguous factor loadings clearly distinguished the factors. This provided significant guidance and understanding in the interpretation task.

The hypothesized seventh factor's deafness-related variable loadings did not remain intact under an Integration of Hearing Impairment construct. However, the deafness-related variables concerning the important adaptive reaction as well as those concerning the deaf community, sign language and supervision remained together as major concepts contributing to a construct or factor. This new configuration was named, based on interpretation, Integration of Hearing Impairment into the Family Environment (factor 3).

The deafness-related communication variables (11 in all) involving parental knowledge and activities moved over to the first factor. Factor 1 was interpreted as also having a heavy knowledge and involvement in child's current school progress influence. Since the first factor is the principal factor, it is expected to have a larger number of variables loading on it. As interpreted here, the press for knowledge and involvement in school progress and the press for knowledge and involvement with the deaf child's handicap (language and communication) are theoretical complements.

The child-rearing variables joined with other variables of similar orientation to form their own factor (6). The variables designed to define parents' level of school satisfaction (factor 4) did so without interference from other variables. Factor 4 is unique to this study as Marjoribanks' analysis did not identify a construct of this nature as a dimension of the home learning environment.

The salience of the deafness-related variables was a particularly interesting outcome of this factor analysis. Also, the nature of their contribution to the variable clusters on the first and third factors was conceptually significant.

The results of the factor analysis provided promise for further development of the Family Environment Instrument. An early task would be to further refine the original input variable list of 100 items in an attempt to sharpen the factors. For the present study the factor analysis provided for data reduction thereby facilitating further analyses.

2. What is the effect of differences in family socio-economic levels, sex, ordinal position, family size, I.Q., type of student and communication mode used by the child in the school on the strength of the relationship between the family environment and educational achievement?

The literature is replete with claims that differences in certain status characteristics of the child and his/her family play a role in accounting for differences in academic achievement as well as differences in interactions and behaviors occurring in the family (family environment). For example, one explanation for differences in academic achievement and family environment occurring among children of different family structures is that parents provide different experiences for first-borns than later-borns and that families with large numbers of children interact with their children differently than do families with fewer children.

One way to investigate this influence among this study sample is to examine the differential effects of differences in these status characteristics on the strength of the relationship between family environment and academic achievement. In the bivariate correlation analyses (zero-order) performed to answer this study question, these differential effects of variability across status characteristics were "controlled" by examining, at each status characteristic "level," the strength of the relationship between academic achievement and family environment and by comparing the strength of the relationships across different levels of each characteristic.

The reader is reminded first, that the family environment index was the score obtained by summing the values of the variables (item scores) comprising the six factors derived from the factor analysis procedure. Second, the family environment concept for this study question was represented equivocally by the six factors (constructs) and no effort has yet been made in the analysis to identify those family behaviors (constructs) called presses after Murray (1938) or to measure their magnitude and directionality relative to academic achievement. This will be done in subsequent analysis and the environment in the family then is called the family learning environment.

For the examination of the effect of differences in status characteristics on the strength of the relationship between family environment and academic achievement, subprogram PEARSON CORR of the SPSS was used to compute Pearson product-moment correlation coefficients. The results are presented in Table 2.

It can be seen by comparing correlation coefficients for family environment and academic achievement across all five family socio-economic levels, for boys and girls, and for either first- or later-borns that the strength of the relationship does not seem to be effected by differences in these three variables. That is, the correlation at any level is not substantively different than that at any other level within the same characteristic.

On the other hand, when the magnitude of the correlations for commuter or residential student, communication modes used in school, I.Q. level, and family size are compared, it can be observed that differences existed differentially across academic content areas.

Overall, the results of this analysis explored the interaction of various demographic characteristics with the relationship of family environment and academic achievement. A pattern emerged especially for the correlation of reading comprehension and family environment. Of all characteristics, differences in FAMSIZE, COM/MODE SCHOL, student type and I.Q. interacted most with the family and academic achievement relationship.

3. Which underlying constructs of the family environment best predict the academic achievement of hearing impaired children?

The analyses of the relationship of the family environment constructs (the six factors) to the hearing impaired child's academic achievement are described in the next several pages.

Table 2

Pearson Correlations Between Family Environment and Academic Achievement Across Differences in Status Characteristics

Academic Achievement			Demographic Characteristic Level
Reading Comprehension	Math Concepts	Math Computation	
0.1062 (4) P= .447	0.1074 (5) P= .432	-0.0985 (5) P= .437	FAMSES[a] = 1
0.0324 (12) P= .460	-0.1827 (12) P= .285	-0.3675 (12) P= .120	FAMSES = 2
-0.1622 (24) P= .225	0.2000 (24) P= .174	-0.0766 (25) P= .358	FAMSES = 3
-0.1586 (13) P= .302	0.0621 (16) P= .410	0.2039 (16) P= .224	FAMSES = 4
-0.0722 (8) P= .433	0.3560 (10) P= .156	0.0481 (10) P= .447	FAMSES = 5
-0.1445 (59) P= .137	0.1108 (64) P= .192	-0.0729 (65) P= .282	KRANK[b] = 1
-0.2019 (23) P= .178	-0.1856 (24) P= .193	-0.1180 (24) P= .292	KRANK = 2

Table 2 - Continued

Academic Achievement Reading Comprehension	 Math Concepts	 Math Computation	Demographic Characteristic Level
0.5253 (9) P= .073	0.6022* (10) P= .033	0.2170 (11) P= .261	FAMSIZE^{c} = 1
-0.1966 (31) P= .145	0.0354 (33) P= .422	-0.0736 (33) P= .342	FAMSIZE = 2
-0.0058 (21) P= .490	0.0570 (22) P= .401	-0.0270 (22) P= .452	FAMSIZE = 3
-0.3634 (21) P= .053	-0.0721 (23) P= .372	-0.0542 (23) P= .403	FAMSIZE = 4
-0.6236** (16) P= .005	-0.6845** (11) P= .010	-0.7378** (11) P= .005	COM/MODE^{d} SCHOL = 1
-0.2876** (66) P= .010	-0.1022 (77) P= .188	-0.1366 (78) P= .117	COM/MODE SCHOL = 2
99.0000 (0) P=*****	99.0000 (0) P=*****	99.0000 (0) P=*****	COM/MODE SCHOL = 3
-0.1597 (47) P= .142	0.0768 (48) P= .302	-0.2025 (49) P= .081	SEX^{e} = 1
-0.2307 (35) P= .091	-0.0748 (40) P= .323	-0.0689 (40) P= .336	SEX = 2
-0.2995* (37) P= .036	-0.0743 (37) P= .331	-0.1454 (37) P= .195	STUDENT^{f} TYPE = 1
-0.1311 (45) P= .195	0.0239 (51) P= .434	-0.1058 (52) P= .228)	STUDENT TYPE = 2

Table 2 - Continued

Academic Achievement			
Reading Comprehension	Math Concepts	Math Computation	Demographic Characteristic Level
99.0000 (0) P=*****	99.0000 (0) P=*****	99.0000 (0) P=*****	IQ[g] = 1
-0.7079* (8) P= .025	0.5222 (9) P= .075	0.3998 (9) P= .143	IQ = 2
0.0816 (26) P= .346	0.2289 (26) P= .130	-0.0442 (26) P= .415	IQ = 3
-0.0876 (27) P= .332	0.1807 (30) P= .170	-0.0654 (30) P= .366	IQ = 4
-0.4537* (17) P= .034	-0.3636 (18) P= .069	-0.0495 (19) P= .420	IQ = 5
-0.7283 (3) P= .240	0.1315 (4) P= .434	-0.1634 (4) P= .418	IQ = 6

(Coefficient/(Cases)/Significance) (A value of 99.0000 is printed if a coefficient cannot be computed.

* $p < .05$

** $p < .01$

[a] FAMSES = Family Socio-Economic Level (1 = high, to 5 = low)

[b] KRANK = Ordinal Position of Study Child (1 = first-born, 2 = later-born)

[c] FAMSIZE = Number of Children in Family

[d] COM/MODE SCHOL = Primary Communication Mode generally used in school by child (1 = primarily oral, 2 = simultaneous, 3 = primarily manual)

[e] SEX (1= boys, 2 = girls)

[f] STUDENT TYPE (1 = residential, 2 = commuter)

[g] IQ (1 = low, to 6 = high)

The Relationship of the Constructs of the Family Environment and Academic Achievement

Academic achievement for this study was comprised of percentile scores for reading comprehension, math concepts and math computation. Three discriminant analyses, one for each academic area, were conducted to answer the first question of this study. The upper and lower thirds of the percentile scores distribution for reading, math concepts and math computation provided the basis for three step-wise discriminant analyses employing the six factor scales from the Family Environment Instrument.

Factor scale scores were computed for each case by summing his/her raw scores on variables with rotated factor loadings of .30 and above on a particular factor. This optimized the internal consistency reliability of each scale. Inter-scale correlation did not result from this procedure as shown by the within groups correlation matrix tables.

Discriminant analysis allowed for interpreting or describing the high and low group differences and for classifying individuals into high and low achievement groups.

As for interpreting, the ways in which the groups differed were studied by discriminating between the groups on the basis of the set of six underlying family environment constructs (factors), by statistically testing how well this set of discriminating variables (the six factor scales) distinguished the groups, and by determining which factors were the most powerful discriminators.

Discriminant analysis was also used as a classification technique in this study. That is, as a check of the adequacy of the discriminant function, the hearing impaired students (cases) in this study with known high or low achievement group membership were classified to see how many were correctly classified by the discriminating variables. Also, for future applications, because it was determined which variables did well in classifying group membership, those variables can be used to predict the likely group membership of new cases with unknown memberships.

Subprogram DISCRIMINANT from the SPSS was performed. Rao's V was used as the step-wise criterion.

Reading Comprehension Results

Table 3 displays the means, standard deviations and univariate F-ratios for each of the six predictor variables. Significant univariate F-values were found on three variables: Child-Rearing Orientation, Parental Aspirations and Expectations for Child's Academic and Occupational Achievements, and Concern for School Progress and the Use and Development of Language and Communication.

Compared to hearing impaired children in the low reading comprehension group, hearing impaired children in the high reading achievement group came from families with more "favorable" child rearing orientations, had parents who had higher expectations for their child but also had parents who were less concerned for the child's school progress and language communication development.

Recall that the Family Environment Interview Instrument is scored so that 1 = the desirable/favorable behavior or response and 6 = the least desirable/favorable behavior or response. On the other hand, a high absolute value reading score is desirable.

Table 3

Reading Group Means[a], Standard Deviations, and Univariate F-Ratios for Six Family Environment Variables

Variable	High Reading Comprehension (n = 28)		Low Reading Comprehension (n = 29)		Univariate F-Ratio[b]
	Mean	S.D.	Mean	S.D.	
Child-Rearing Orientation	32.25	5.89	35.17	5.49	7.16 **
Integration of Hearing Impairment	26.07	6.18	28.59	3.51	2.45
Parental Aspirations for Child's Academic and Occupational Achievements	43.39	7.58	46.48	9.49	4.25 *
Parents' Aspirations Work and Leisure	18.04	4.08	19.21	2.94	1.91
Concern for School, Language, Communication	82.14	19.36	76.69	21.73	10.15 **
Parents' School Satisfaction	25.39	2.45	25.00	2.71	.01

[a] Scoring: 1 = favorable, desirable behavior, to 6 = unfavorable, undesirable behavior

[b] Degrees of freedom = 1, 56

* $p < .05$

** $p < .01$

With the exception of SCHLANCOM, on each of the variables in Table 3 for which the univariate F-ratios were statistically significant, the group differences were in directions predictable from earlier family environment research. While the univariate F's for the remaining three variables were non-significant, the group means for two, Integration of Hearing Impairment and Parents' Aspirations for Work and Leisure, were also in directions predictable from theory and earlier research.

The results of the first step-wise discriminant analysis are shown in Table 4. This step-wise discriminant analysis used the six Family Environment Instrument factor scales to interpret group differences and to predict high or low reading group membership in the hearing impaired sample with reading scores. The analysis was conducted over 29 low achievers in reading comprehension and 28 high achievers. From the 124 families, reading data were received for 86 children. Five of the six factor scales entered the equation with an F to enter here and after set at $>$ 1.0. The factors that entered were: Child-Rearing Orientation; Integration of Hearing Impairment into the Family Environment; Parental Aspirations and Expectations for Child's Academic and Occupational Achievements, Parents' Aspirations for Work and Leisure, and Concern for School Progress and the Use and Development of Language and Communication. The analysis produced an overall Wilks lambda of .723 with an associated chi square value of 17.03 with 5 degrees of freedom significant at the .004 level and a canonical correlation of .526 for the discriminant function.

This solution explained 27.6% of the group variance and classified 72% of the hearing impaired children used in the analysis correctly. Confidence intervals, using the t- statistic ($t_{.01,55}$) and the standard error, were

Table 4

Summary of Step-wise Discriminant Function Analysis[a] for Family Environment Factor Scales Predicting High and Low Achievers in Reading Comprehension

Step	Variable	Standardized Coefficients	Wilks Lambda	Change in Rao's V	Significance of Change in V	Within Structure Coefficient Function 1
1	CRORIEN	.735	.936	3.76	.053	.422
4	INTHI	.418	.750	4.35	.037	.414
3	PASPACOC	.609	.797	6.82	.009	.295
5	PASPWORKLEIS	.411	.723	2.75	.098	.272
2	SCHLANCOM	-1.036	.885	3.40	.065	-.218
-	SATSCHOL[b]	----	----	----	----	.099

Canonical Correlation = .526

Canonical R^2 = .276

Centroids: Reading Comprehension Highs = -.619
Reading Comprehension Lows = .597

Percent Correct Classification: Highs 64%
(Priors = .50) Lows 79%
Overall 72%

Improvement-Over-Chance Index: 44%

[a] Minimum F to Enter = 1.0

[b] This variable did not enter the equation

calculated at various levels to examine the statistical significance of the hit rate. For reading achievement scores (N=57) the percentage of correctly classified cases clearly falls outside the 99% confidence interval (since 72% is greater than 67.8%) and is, therefore, significant.

Klecka (1980) suggested calculating tau (a proportional reduction error statistic) to get a standardized measure of improvement over chance of the percent correct classification. Huberty (1983) labeled this the Improvement-Over-Chance Index. For reading comprehension the Improvement-Over-Chance Index was I=44%, which means, that by using this classification rule, the hit rate was improved by 44% over chance or, from another perspective, that 44% fewer classification errors resulted using this classification rule than would have by chance.

The results of the stepwise selection of variables for discriminant analysis will be interpreted by the within structure coefficients which represent the variable to function correlation. Unlike the standardized coefficients which take into consideration the simultaneous contributions of all the other variables, the structure coefficients are simple bivariate correlations; thus, they are not affected by interrelationships among the predictor variables. Notice the rather small structure coefficient of SCHLANCOM which means it has fairly little in common with the function. This is a different impression than given by the standardized coefficient of SCHLANCOM which was rather large. As shown in Table 5, SCHLANCOM is fairly highly correlated with PASPACOC (.460) and with PASPWORKLEIS (.451) so they are each making rather large contributions in opposite directions (have opposite signs) which cancels out SCHLANCOM. This small net effect represents

Table 5

Pooled Reading Comprehension Within-Groups Correlation Matrix for Family Environment Variables

	SCHLANCOM	PASPACOC	INTHI	SATSCHOL	PASPWORKLEIS	CRORIEN
SCHLANCOM	1.000					
PASPACOC	0.460	1.000				
INTHI	0.195	0.100	1.000			
SATSCHOL	0.305	-0.030	-0.017	1.000		
PASPWORKLEIS	0.451	0.295	0.194	0.128	1.000	
CRORIEN	0.369	-0.000	0.077	0.258	0.091	1.000

the true effect of SCHLANCOM upon the function. Klecka (1980) discusses the perverse tendency of such situations to arise in discriminant analysis and suggests that the structure coefficients are a better guide to the meaning of the canonical discriminant functions than the standardized coefficients are.

The within structure coefficients which are correlations between the function and the discriminating variables are derived for each variable whether or not it was selected in variable selection. The variables in Table 4 are grouped according to the function with which they are most highly correlated (in this case there was only one function). Within this group, the variables are sorted in descending order by the magnitude of that largest correlation (Hull & Nie, 1981).

Examination of the absolute magnitude of the structure coefficients indicated that Child-Rearing Orientation and Integration of Hearing Impairment into the Family Environment had the strongest relationship to the function. Relatively substantial relationships derived from the Parental Aspirations for the Child's Academic and Occupational Achievements and from Parents' Aspirations for Work and Leisure variables. A modest relationship, about half of CRORIEN, was derived from the SCHLANCOM variable. Given this function comprised primarily the CRORIEN and INTHI variables of the family environment, and given the directionality of the group means, this function might appropriately be named the "Press for Interactive Child-Rearing" function. This suggests that although the two variables were not correlated with each other (.077), they seem to be measuring a conceptually complementary construct best characterized by parental interaction with rather than to or for the child. This will be discussed further in a later section.

Math Concepts Results

Table 6 presents the means, standard deviations and univariate F-ratios for each of the six predictor variables. A significant univariate F-value was found on one variable: Concern for School Progress and the Use and Development of Language and Communication.

Compared to hearing impaired children with low achievement in math concepts, hearing impaired children in the high math concepts group had parents who were less concerned for the child's school progress and language and communication development.

While the univariate F's for the remaining five variables were not significant, the groups means for four were in directions predictable from theory and earlier research, i.e., more favorable family environment constructs (low absolute value of the four variables) were related to high achievement in math concepts.

The second step-wise discriminant analysis reported here used the same six factor scales derived from the factor constitution of the Family Environment Instrument to interpret and predict high and low achievers in math concepts. The analysis was conducted over 31 low achievers and 32 high achievers from an overall data base of 93 students for whom math concepts scores were received. Four of the six factor scales entered the equation (see Table 7). The factors that entered were: Concern for School Progress and the Use and Development of Language and Communication; Parental Aspirations for Work and Leisure; Integration of Hearing Impairment into the Family Environment; and lastly, Child-Rearing Orientation. The analysis produced an overall Wilks Lambda of .862 with an associated chi square value of 8.64 with

Table 6

Math Concepts Group Means[a], Standard Deviations, and Univariate F-Ratios for Six Family Environment Variables

Variable	High Math Concepts (n = 32)		Low Math Concepts (n = 31)		Univariate F-Ratio[b]
	Mean	S.D.	Mean	S.D.	
Concern for School, Language, Communication	80.19	18.89	74.16	19.00	6.36 *
Parents Aspirations Work and Leisure	17.45	3.51	18.55	3.46	3.09
Integration of Hearing Impairment	27.26	6.04	28.90	5.09	2.44
Child-Rearing Orientation	32.16	6.47	33.19	6.19	1.32
Parental Aspirations for Child's Academic and Occupational Achievements	44.45	7.23	45.52	9.40	.56
Parents' School Satisfaction	25.03	3.04	24.94	3.19	.03

[a] Scoring: 1 = favorable, desirable behavior, to 6 = unfavorable, undesirable behavior

[b] Degrees of Freedom = 1, 61

* $p < .025$

Table 7

Summary of Step-wise Discriminant Function Analysis[a] for Family Environment Factor Scales Predicting High and Low Achievers in Math Concepts

Step	Variable	Standardized Coefficients	Wilks Lambda	Change in Rao's V	Significance of Change in V	Within Structure Coefficient Function 1
1	SCHLANCOM	-1.055	.974	1.57	.210	-.404
2	PASPWORKLEIS	.665	.921	3.60	.058	.399
3	INTHI	.578	.882	2.89	.089	.373
4	CRORIEN	.449	.862	1.58	.209	.207
-	PASPACOC[b]	----	----	----	----	-.094
-	SATSCHOL[b]	----	----	----	----	-.023

Canonical Correlation = .372

Canonical R^2 = .138

Centroids: Math Concepts Highs = -.394
Math Concepts Lows = .394

Percent Correct Classification: (Priors = .50)		
	Highs	69%
	Lows	61%
	Overall	65%

Improvement-Over-Chance Index: 30%

[a] Minimum F to Enter = 1.0

[b] This variable did not enter the equation

4 degrees of freedom, significant at the .07 level and a canonical correlation of .372. This solution explained 13.8% of the group variation in the hearing impaired math concepts sample and correctly classified 65% of the students used in the analysis.

Confidence intervals using the t-statistic ($t_{.05,61}$) and the standard error were computed to examine the statistical significance of the 65% hit rate for math concepts. Since the 95% confidence interval ranged from 37.3% to 62.7%, the observed overall hit rate was statistically significant.

The improvement-over-chance index was calculated to be 30%; this means that 30% fewer classification errors resulted using a classification function based on the discriminating variables than would have by chance.

The results of the step-wise discriminant analysis for predicting high and low group membership for math concepts achievement were interpreted by the within structure coefficients rather than the standardized discriminant coefficients. However, for this function, the interrelationships among the variables were low with the exception perhaps of CRORIEN and SCHLANCOM (.431) (see Table 8). This means that the standardized coefficients were probably not affected by shared discriminating information and that the relative absolute values of the structure and standardized coefficients can be interpreted in a similar straightforward manner. However, CRORIEN and SCHLANCOM's relationship to the function in opposite directions may account for the net effect of reducing SCHLANCOM's relationship from over twice as great as CRORIEN's to less than half CRORIEN's relationship as indicated by the structure coefficients.

Table 8

Pooled Math Concepts Within-Groups Correlation Matrix for Family Environment Variables

	SCHLANCOM	PASPACOC	INTHI	SATSCHOL	PASPWORKLEIS	CRORIEN
SCHLANCOM	1.000					
PASPACOC	.269	1.000				
INTHI	.333	.149	1.000			
SATSCHOL	.159	-.112	.083	1.000		
PASPWORKLEIS	.399	.177	.121	.082	1.000	
CRORIEN	.431	-.032	.150	.196	.189	1.000

In descending order by magnitude of the structure coefficients, the contributions of three variables seem to comprise this function: SCHLANCOM, PASPWORKLEIS and INTHI. Unlike its strengths for predicting high and low reading comprehension, Child-Rearing Orientation was of minor importance for discriminating high and low achievers in math concepts.

It is difficult to interpret and label this function because the structure coefficients of the three highest discriminating variables are rather similar in magnitude, and the most powerful variables: Concern for School, Language and Communication and Parents' Aspirations for Work and Leisure are conceptually incompatible except perhaps that given their signs and content it is a parent-centered influence on the dimension. It is proposed based on the author's best judgment, that given the magnitude of SCHLANCOM and its negative sign, the dimension be named a "Press for Directiveness" due to the nature of this variable's item content.

Math Computation Results

The group means, standard deviations and univariate F-ratios for each of the six predictor variables are displayed in Table 9. The only family environment variable found to have a significant univariate F was Parental Aspirations for the Child's Academic and Occupational Achievements. The hearing impaired children in the high achieving math computation group had parents with higher, more specific and better planned expectations for their children's academic and occupational achievements than did those in the low achieving math computation group.

Even though the univariate F-values for the other five discriminating variables were not significant, the group means for three were in directions

Table 9

Math Computation Group Means[a], Standard Deviations, and Univariate F-Ratios for Six Family Environment Variables

Variable	High Math Computation (n = 33) Mean	High Math Computation (n = 33) S.D.	Low Math Computation (n = 30) Mean	Low Math Computation (n = 30) S.D.	Univariate F-Ratio[b]
Parental Aspirations for Child's Academic and Occupational Achievements	41.87	7.87	48.90	8.36	11.44 *
Concern for School, Language, Communication	75.68	19.78	77.40	19.43	.84
Parents Aspirations Work and Leisure	17.97	3.91	18.10	3.73	.37
Integration of Hearing Impairment	27.19	6.66	28.10	5.03	.00
Child-Rearing Orientation	33.19	6.68	32.70	5.05	.00
Parents' School Satisfaction	25.32	2.71	24.77	2.79	.49

[a] Scoring: 1 = favorable, desirable behavior, to 6 = unfavorable, undesirable behavior

[b] Degrees of Freedom = 1, 60

* $p < .001$

predictable from theory and earlier study. That is, a favorable family environment, as measured by these constructs, was likely to discriminate between high and low achievement in math computation.

Table 10 summarizes the third discriminant analysis when the same six factor scales were used to predict high and low achievers in math computation. The analysis was conducted over 30 low achievers and 33 high achievers from an overall data base of 94 students for whom math computation scores were received. One of the six factor scales entered the equation, Parental Aspirations and Expectations for Child's Academic and Occupational Achievements. The analysis produced an overall Wilks Lambda of .837 with an associated chi square value of 10.37 significant at .001.

This solution found a canonical correlation of .403 and it explained 16.2% of the group membership variance in the math computation sample. The overall correct classification of the math computation high and low achievers was 59%, with the analysis showing that 64% of the high achievers and 53% of the low achievers were correctly classified. For math computation, the percentage of cases correctly classified, i.e., the hit rate of 59%, did not differ in a statistically significant manner from chance. At the 95% confidence interval the hit rate would be statistically significant if it fell outside th interval of 50±12.7 percent. However, the computation of the improvement-over-chance index showed that 18% fewer classification errors resulted using this classification rule than would have by chance.

The results of the step-wise discriminant analysis for predicting high and low group membership in math computation achievement was interpreted by the within structure coefficients. The within group variable to function correlations are shown in Table 11.

Table 10

Summary of Step-wise Discriminant Function Analysis[a] for Family Environment Factor Scales Predicting High and Low Achievers in Math Computation

Step	Variable	Standardized Coefficients	Wilks Lambda	Change in Rao's V	Significance of Change in V	Within Structure Coefficient Function 1
1	PASPACOC	1.000	.837	11.44	.0007	1.000
-	SCHLANCOM[b]	-----	----	-----	-----	.378
-	PASPWORKLEIS[b]	-----	----	-----	-----	.232
-	INTHI[b]	-----	----	-----	-----	.205
-	CRORIEN[b]	-----	----	-----	-----	-.069
-	SATSCHOL[b]	-----	----	-----	-----	-.005

Canonical Correlation = .403

Canonical R^2 = .162

Centroids: Math Concepts Highs = -.426
Math Concepts Lows = .440

Percent Correct Classification: (Priors = .50)		
	Highs	64%
	Lows	53%
	Overall	59%

Improvement-Over-Chance Index: 18%

[a] Minimum F to Enter = 1.0

[b] This variable did not enter the equation

Table 11

Pooled Math Computation Within-Groups Correlation Matrix for Family Environment Variables

	SCHLANCOM	PASPACOC	INTHI	SATSCHOL	PASPWORKLEIS	CRORIEN
SCHLANCOM	1.000					
PASPACOC	.378	1.000				
INTHI	.236	.205	1.000			
SATSCHOL	.190	-.006	.090	1.000		
PASPWORKLEIS	.410	.232	.266	.139	1.000	
CRORIEN	.251	-.069	.061	.225	.068	1.000

The structure coefficients indicate how closely a predictor variable and a function are related. When the absolute magnitude of the coefficient is very large (near +1.0 or -1.0), the function and variable are carrying nearly the same information (Klecka, 1980). Similarly, when the coefficient is near zero, the variable and function have very little in common. Inspection of the structure coefficients indicated that this function comprised almost entirely the Parental Aspirations for the Child's Academic and Occupational Achievements construct of the family environment, which contributed from almost three to five times as much discriminating power to the function as any of the remaining variables not considering CRORIEN (14x) or SATSCHOL (200x). This function might, therefore, without any ambiguity appropriately be labeled the "Press for Achievement" function for discriminating between high and low achievers in math computation.

For illustrative purposes, the centroids of the high and low achievement groups on each of the three separate discriminant functions are displayed in Figure 1. It can be seen that each function resulting from three step-wise discriminant analyses: Press for Interactive Child-Rearing for reading, Press for Directiveness for math concepts and Press for Achievement for math computation, represented by the axes, define a one-dimensional space with each of the two groups located on a point in positive or negative space. Recognizing that the symbolic representation of linear distances represented in the group means can be deceiving, depending on the scale units selected, the reader is cautioned against attributing greater separation between the centroids than is warranted. The proportion of cases correctly classified and the improvement-over-chance index should be referred to in considering Figure 1 in that they indirectly confirm the degree of group separation.

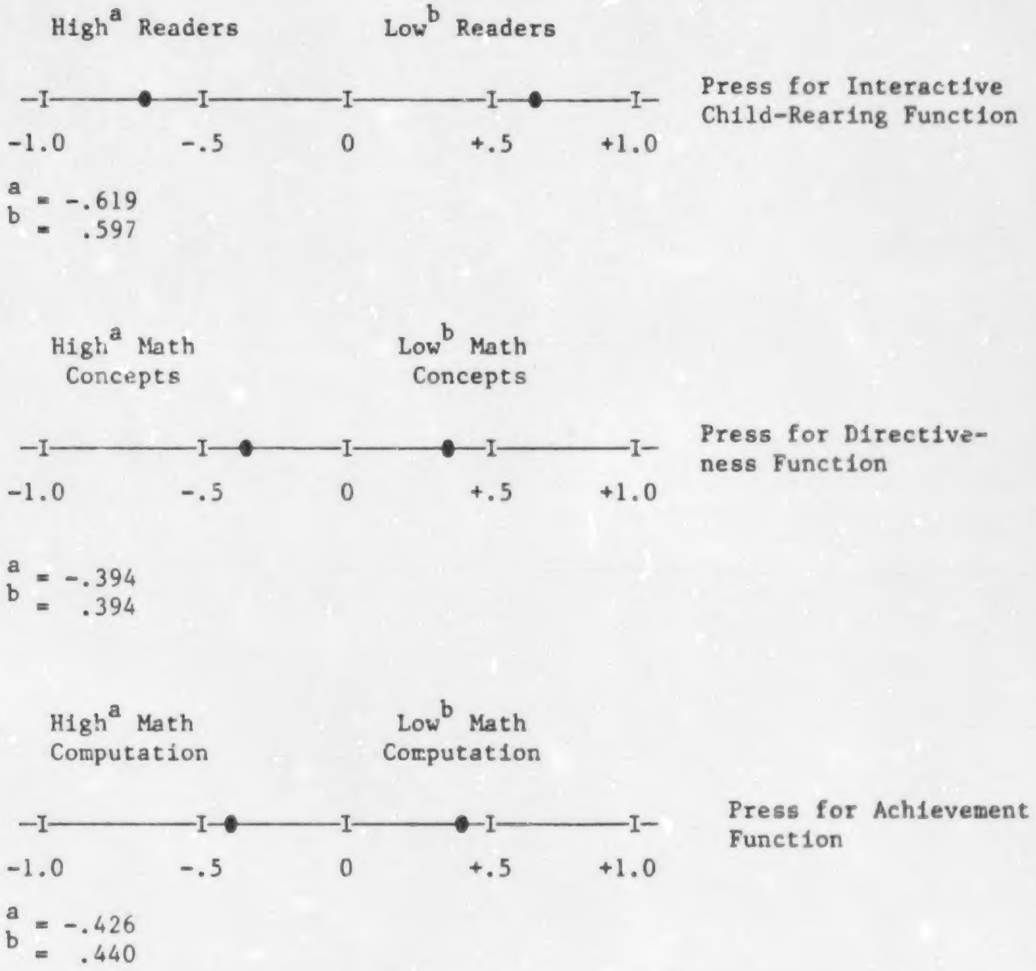

Figure 1: Centroids of High and Low Academic Achievement Groups in One-Dimensional Space Defined by Three Separate Discriminant Functions.

Appendix E contains the Group Stacked Histograms for the three analyses. By placing the histograms above one another, the density, distribution and relative locations of the centroids can be compared. Examination of these plots reveals the degree of overlap between the groups. The plot for high and low math computation groups shows the most overlap and reading comprehension the least. This provides another way to perceive the discriminating power of the discriminant functions.

Discussion of Results

The results of these analyses indicated that it is possible to discriminate on certain family environment characteristics between groups of 10-13 year old hearing impaired children, classified into one of two groups of high or low achievement in reading comprehension, math concepts and math computation. Further, and more importantly, the analyses indicated these differentiations were based on underlying dimensions of the family environment (the discriminant functions), the compositions of which are, for the most part, consistent with what theory and research would predict. These analyses also provided a means for classifying individual cases into the achievement group they most closely resembled. The interpretation of these results contributes much to our understanding of hearing impaired children.

What we know about hearing impaired children's academic learning and their family environments, up to this point, has been astoundingly little. Because of this, many of the results from this study are ground-breaking and are interpreted by way of seeking conceptual consistency among the findings and within a theoretical framework. Convention in an exploratory study of this nature dictated that an effort should be made not to overlook results that might be interesting and substantively meaningful even when it meant interpreting tests of significance leniently. In all cases when this occurred it is made obvious to the reader.

Reading Comprehension

Examination of the item content that made up the factor scale structures of CRORIEN and INTHI which comprised the "Press for Interactive Child-Rearing" function yields an interpretation of the nature of the function and possible explanations as to why it predicted high and low reading comprehension. That is the family environments of those children in the high reading group was statistically and substantively different than the family environments of children in the low reading group.

Several of the behaviors measured by CRORIEN and INTHI relate to the parents and child doing activities together, e.g., "The extent and content of educational activities parents and child engage in together," VAR 247. The important characteristic of families with children in the high reading group is that the parents do things and are involved with their children rather than directing activities at, to and around them; or the nature of the activity itself is interactive as in "Parents read to their child at an early age." Related to this, the parents' behavior toward their child seems to be guided by perceptions of him/her as an individual of "equal status" to the parent rather than as a child and a handicapped child with "child status" or status different than other children would have in the family. The child's independence as a person is recognized in "Age child is allowed or expected to earn spending money," "Age he/she is expected to make certain decisions," and early on in life when this independence for the child was first established, "Age when the child was expected or allowed to play around the neighborhood."

It is proposed here that the parents' interactive, respect-for-person behaviors toward their child were influenced further by the adaptation they have made to his/her deafness (VAR 286, VAR 288). Families with children in the high reading group reported having dealt with the reality of their child as a person with deafness.

This interpretation is in consonance with Kelly's Constructive Alternativism view (1955) which proposes that an individual's personal belief systems (constructs) contribute significantly, guide, and are the directing source of behaviors in interactions with other people. Thus, the parents' constructs of "child," "child-rearing" in general, and of "hearing impaired child" particularly are taken to be sources of parental behaviors with their hearing impaired child. That this integration of constructs occurred, it is suggested, is exemplified by the activity of parents reading to the child before preschool in spite of the difficulties recognized due to the existence of severe hearing loss. Effective application of the principles entailed in constructionist theory to family intervention should increase parent-child interaction. At least, the hypothesis is worthy of further investigation.

As to why this "Press for Interactive Child-Rearing" function predicted high and low readers, studies over the last three decades have shown an association between various family resources and skill in reading. Before that research is summarized, a description of what reading comprehension involves is presented.

Reading comprehension is one of the component skills of the act of reading. Others are attention, memory, decoding, knowledge of words and syntax. In the comprehension part of reading, the reader makes the symbols meaningful by creating a context for the text within which it becomes understood. Thus, comprehension involves applying one's personal experiences and knowledge of the world to give meaning to the surface structures of the sentences. The meaning of a passage comes from active participation of the reader that involves calling up and organizing information to be applied to the act of reading (Hess, et al., 1982).

Two of the family resources belonging to this function that have been found to facilitate reading are:

Reading to children. This function comprised parent reading to the child at an early age (VAR 211 in CRORIEN). The tendency of parents to read to their children has been correlated with performance in measures of reading proficiency (Clark, 1976). Reading aloud also correlated with performance on reading tests (Hansen, 1969). It is suggested here that reading to children not only models reading behavior but the interaction--the activity of reading to children--may be the means through which the comprehension results were achieved.

Exposure to a variety of activities. Research suggests that children's reading skills profit from prior exposure to varied experiences. Superior readers attended more cultural activities than average readers and participated in more varied activities (Miller, 1969). This function comprised an exposure to varied activities (VAR 247, CRORIEN).

The activity of reading to their children and engaging in a wider variety of activities together implies parents are involved with their children and think of them as individuals with particular interests, likes and abilities.

They "match" the activities to the child. This relates to the first part of this discussion regarding the person-centered nature of the interaction.

To judge the substantive utility of the "Press for Interactive Child-Rearing" function for predicting high and low reading, the data in Table 4 should be studied. Given the results of the classification analysis and the canonical correlation of the function with group membership, it is suggested that this function is moderately powerful and its interpretation should be considered a salient finding of this study. The outcome of this analysis contributed to our understanding and knowledge in the reading area and does in fact carry substantive utilitarian information.

Math Concepts and Math Computation

The results of math concepts and math computation will be discussed together in this section.

For math concepts an examination of the item content of SCHLANCOM, the discriminating variable on which this function "Press for Directiveness" is labeled, and a look at the nature of achieving in this academic area, allows possible resolution of the finding that hearing impaired children who do well in math concepts come from homes where there is a lack of behaviors described as a Concern for School Progress, Use and Development of Language and Communication.

The cognitive processes and learning style required to do well in math concepts involve the ability to deal with abstractions and the need to think in "unusual" ways, that is, to develop systems of thinking not necessarily tied to what can be observed. These abilities on any level imply a willingness not to accept standard answers but rather to probe for solutions. These abilities are nurtured by an environment that encourages the individual to develop these particular strategies of problem solving as well as creativity. An environment characterized by a great deal of emphasis on immediate and specific concerns and problems, such as correcting the child's grammar, teaching him new words or signs, and knowledge of and attention to school progress in specific areas, may not foster the development of the divergent, exploratory style of thinking required for dealing with math concepts.

On the other hand, the ability to achieve in math computation involves the ability to follow rules, to apply in a systematic fashion material that is memorized, and to practice. Overall, it is suggested that math computation achievement requires mental skills that are more defined and limited.

In this study, hearing impaired children who did well in math computation came from families characterized by a "Press for Achievement" function named for the single variable with which it correlated (1.000), Parental Aspirations and Expectations for the Child's Academic and Occupational Achievements. These are families who have high and specific expectations and organized plans in place for the child's future academic and occupational life. Parents of the high achieving math computation group were goal directed people who expected their children to spend more time daily doing homework, and probably believe their children will achieve in life if they know math because they reported they believe their children's school curriculum should contain more math. There may be a cycle of reinforcing events occurring here: Parents expect, indeed, push their children to spend more time doing homework. Because they believe "math" is a skill needed to achieve in life and because deaf children tend to do well in math computation (probably because language skills are less involved), the push to do homework becomes a push to do math computation homework. Interacting with this cycle is the tendency for teachers to give more math computation homework. Math computation homework might be more popular with teachers than giving the children math concepts problems to work on outside of school because first, computation likes "practice" rather than problem-solving and, second, the children do well in math computation so the homework is reinforcing for the child and the achievement is reinforcing for the teacher and the parents. This hypothetical cycle is worthy of further identification and study.

Interpretation of the results of the discriminant analyses for high and low math concepts and math computation achievement groups was more difficult than for reading comprehension. To judge the substantive utility of these two functions for predicting high and low achievement, the data in Tables 7 and 10 should be reviewed. Given the exploratory approach of this interpretation these solutions are studied for their potential interest, as well as their application value. The reader should recognize, however, that the solutions carry substantive but relatively modest discriminating power. The family characteristics of the high and low achievers in the math areas were probably less differential than in reading and had less discriminating ability to predict group membership. Although the group variance explained (canonical R^2) in both solutions is acceptable in terms of using the results of the function to do further analysis, those characteristics that were identified in the discussion as predictor variables did so rather modestly. For math computation, it is suggested that insufficient information entered the equation for the discriminating variables to "make a decision" about which group a specific case "most closely resembled." Thus, the accuracy of the classification procedure was diminished.

In summary, the amount of discrimination contained in the six variables used in these analyses and their predictive accuracy varied relative to the particular high or low academic achievement area being predicted. In each of the three discriminant analysis procedures, an examination of the structure coefficients was combined with an examination of the group centroid positions to discover the meaning of each function. To judge how well each discriminant function did, i.e., its substantive utility, Wilks lambda, the canonical correlations and the percentage of "known" cases correctly classified were carefully considered. This examination led to a judgment of the worth of the function, given they were each statistically significant to a greater or lesser degree, for a particular content area, i.e., reading or math. It is also interesting given that the same set of six predictor variables was used in each analysis, to compare the three analyses with each other even though the composition of the high and low groups in each analysis is in all probability, not identical.

When this study's sample of hearing children was classified into high or low readers, the set of six variables had the greatest discriminating power. That is, the two reading groups were found to be more different on this set of variables than were either high or low math groups on these predictor variables. This means that the family environment characteristics (variables) found to be important on this function and labeled "Press for Interactive Child-Rearing" had more powerful discriminating ability for separating out high and low readers and had greater accuracy than the functions found in the two math areas. The characteristics of families of children in the high reading group were substantively different than the characteristic of families of children in the low reading group.

Evidence that the math concepts and computation achievement groups were less different on the family environment variables analyzed is contained in the modest results of the classification analyses and in the modest Canonical R^2's--especially those for math concepts. However, it is suggested that the analyses derived the weakest solutions (Canonical R^2's) in the math areas because of the substantive influence of the school on the development of math skills. If this is true, the family would have been less important in explaining the variance between the math groups. Since the school environment was not measured in this study, the variance accounted for was confounded by children who did well in math but came from families with "unfavorable" family environments.

Several explanations of these findings are plausible and need further study to verify. Overall, it is probably true that the family environment has greater influence on a child's reading primarily and directly, and secondly, on math computation in an indirect manner as found in this study. Perhaps families are more "familiar" or comfortable with what comprises reading and also math computation. The content is specific, limited and generally more comprehensible than is the math concepts' content. If this is so, families would tend to put their efforts into the reading and math computation areas if they wanted to encourage their child's school learning. They read to the child, they make books available and they expect the child to do homework (which may often be math computation) every day.

Also, the very nature of an active and involved family life influences reading comprehension by affording access to the development of one of the prerequisite skills, that is, the application of one's personal experiences and knowledge to give meaning to the symbols being processed in a passage. The family environment can provide a variety of experiences on an ongoing basis and can, thus, be impacting reading comprehension development. Personal experiences, access to a variety of ideas and knowledge of the world do not in all likelihood affect math computation to a significant degree and it is suggested their impact on math concepts is undermined by other more significant prerequisite skills.

Another explanation for the weak solution for the math groups, again, especially the math concepts groups is that the selection of variables to measure the underlying family environment constructs suggested by Dave (1963) and Marjoribanks (1979) was "invalid" for predicting high and low achievement in math concepts in deaf students. Perhaps another set of discriminating variables operationalizing different family environment constructs would improve the predictive power of the function for this study sample. The other side of this explanation, obviously, is that the selection of family variables on which reading achievement differentiated was "reading-relevant," i.e., they did predict reading achievement group membership.

Further research will explore the outcome of discriminant analyses for reading and math in a number of ways: for example, following the refinement of the factor analysis, "new" family constructs will be analyzed; different patterns of family constructs will be analyzed and, also, high and low achievement groups will be selected on the basis of gender, family SES and similar patterns of achievement across all three content areas.

4. Which demographic variables best predict the academic achievement of hearing impaired children?

The Relationship of Demographic Variables and Academic Achievement

Demographic variables for this analysis were the following:

Family socio-economic level (FAMSES) = scored on Marjoribanks' five-step scale of occupation-by-requisite-education (High = 1; Low = 5).

Family size (FAMSIZE) = number of children in the family; one child = 1, two children = 2, three children = 3, and four to eight children = 4.

Ordinal position (KRANK) = birth order of study child; first born = 1 and later-born = 2.

Communication mode at home (COM/MODE HOM) = primary mode generally used in the home; primarily oral = 1, primarily simultaneous = 2, and primarily manual = 3.

Communication mode at school (COM/MODE SCHOL) = primary mode generally used in the school; primarily oral = 1, primarily simultaneous = 2, and primarily manual = 3.

It is proposed here that the communication mode generally used in the home and school is a relative measure of oralness and manualness for values 1 and 3. The parents were asked what mode of communication is generally used: primarily oral, primarily simultaneous or primarily manual. If the parents reported the communication mode most generally used in the home was oral, in all probability, although most of the communication was carried out using speech, there was a component to a variable degree of manualness in the communication--formal or home made signs, fingerspelling or gestures. It would be extremely rare for the communication mode to be absolutely oral, i.e., 100% oral at all times at home or at school. If the parents reported they or the school used an "oral" mode of communication generally with their deaf child, it was scored "1" meaning for interpretation purposes that the home or school was primarily oral, i.e., more oral than manual. But it is probably true that there was a manual component in the oral communication. This same relativity concept should be applied to the "3" or primarily manual score. This means the mode was primarily manual, i.e., more manual than oral, but there was an oral component in the manual communication. This suggests that the scale represents "manualness" with "1" meaning "less manual more oral;" "2" meaning "half manual half oral;" and "3" meaning "more manual less oral."

Academic achievement was comprised of percentile scores for reading comprehension, math concepts and math computation. The upper and lower thirds of the percentile scores distribution for these three academic achievement areas provided the basis for conducting three step-wise discriminant analyses employing the five demographic variables to answer the fourth question of this study.

Subprogram DISCRIMINANT from the SPSS was performed. Rao's V was used as the step-wise criterion.

Reading Comprehension - Demographic Variables Results

Table 12 displays the means, standard deviations and univariate F-ratios for each of the five predictor variables. Significant F-values were found for FAMSES and COM/MODE SCHOL. Compared to hearing impaired children in the low reading group, children in the high reading group came from families whose parents had higher level occupations and educational attainment and in school used a non-oral communication mode. The direction of the group difference on FAMSES was predictable from earlier studies while the direction of the group difference on COM/MODE SCHOL was not a predicted result of this study. The univariate F's for the remaining three variables were not significant, however, the group means for FAMSIZE and KRANK were also in directions predictable from earlier work. The direction (higher group was non-oral) of the group difference on COM/MODE HOM was not predicted in either direction due to the lack of earlier research in this area.

The results of the step-wise discriminant analysis of five demographic variables to predict high and low reading comprehension groups are shown in Table 13. The analysis was conducted over 29 low achievers and 30 high achievers in reading. Four of the variables entered the equation: COM/MODE SCHOL, COM/MODE HOM, FAMSES and KRANK. The analysis produced an overall Wilks lambda of .763 with an associated chi square value of 16.09 with four degrees of freedom significant at the .003 level and a canonical correlation of .501 for the discriminant function.

This solution explained 25.1% of the group variance and classified 71% of the hearing impaired children used in the analysis correctly. Confidence intervals, using the t- statistic ($t_{.01,57}$) and the standard error, were

Table 12

Reading Group Means, Standard Deviations, and Univariate F-Ratios for Five Demographic Variables

Variable	High Reading Comprehension (n = 30)		Low Reading Comprehension (n = 29)		Univariate F-Ratio[a]
	Mean	S.D.	Mean	S.D.	
FAMSES	3.63	1.59	4.10	1.57	4.28 *
FAMSIZE	2.60	.89	2.69	1.00	.32
KRANK	1.23	.43	1.34	.48	1.09
COM/MODE HOM	1.93	1.08	1.38	.49	1.49
COM/MODE SCHOL	1.93	.25	1.62	.49	8.70 **

[a] Degrees of Freedom = 1, 58

* $p < .05$

** $p < .01$

Table 13

Summary of Step-wise Discriminant Function Analysis[a] for Demographic Variables Predicting High and Low Achievers in Reading Comprehension

Step	Variable	Standardized Coefficients	Wilks Lambda	Change in Rao's V	Significance of Change in V	Within Structure Coefficient Function 1
1	COM/MODE SCHOL	.842	.858	9.45	.002	.700
3	COM/MODE HOM	.342	.763	2.00	.157	.574
2	FAMSES	-.591	.784	6.29	.012	-.261
4	KRANK	-.281	.747	1.50	.219	-.213
-	FAMSIZE[b]	----	----	----	----	-.191

Canonical Correlation = .501

Canonical R^2 = .251

Centroids: Reading Comprehension Highs = .562
Reading Comprehension Lows = -.581

Percent Correct Classification: (Priors = .50)		
	Highs	77%
	Lows	66%
	Overall	71%

Improvement-Over-Chance Index: 42%

[a] Minimum F to Enter = 1.0

[b] This variable did not enter the equation

calculated at various levels to examine the statistical significance of the hit rate. For reading achievement scores (N=59) the percentage of correctly classified cases clearly falls outside the 99% confidence interval (since 71% is greater than 67.6%) and is, therefore, significant.

The improvement-over-chance index was calculated to be 42% which means that 17 actual errors were committed using the classification rule versus 29.5 errors by chance alone.

Using the within structure coefficients as a guide to interpret the meaning of the canonical discriminant function, the magnitude of COM/MODE SCHOL and COM/MODE HOM indicate they by far had the strongest relationship to the function. FAMSES' fairly high interrelationship (.382) with COM/MODE SCHOL (see Table 14) may explain in part why its net effect was reduced, i.e., its individual power (unique relationship to the function) was diffused. Also, FAMSES carried the opposite sign to COM/MODE SCHOL in its contribution on the function which again would explain the net effect of reducing its relationship to the function.

Given this function comprised primarily the COM/MODE SCHOL and COM/MODE HOM variables and given the directionality of the group means, it might appropriately be named the "Press for Simultaneous Communication Mode" function. These two variables seem to be measuring complementary behavior, communication mode, in different settings.

Math Concepts - Demographic Variables Results

Table 15 presents the means, standard deviations and univariate F-ratios for each of the five predictor variables. Significant F-values were found for FAMSES and COM/MODE SCHOL. Compared to hearing impaired children in the low

Table 14

Pooled Reading Comprehension Within-Groups Correlation Matrix for Five Demographic Variables

	FAMSES	FAMSIZE	KRANK	COM/MODE HOM	COM/MODE SCHOL
FAMSES	1.000				
FAMSIZE	.123	1.000			
KRANK	-.060	.683	1.000		
COM/MODE HOM	-.025	.123	.031	1.000	
COM/MODE SCHOL	.382	.037	.026	.268	1.000

Table 15

Math Concepts Group Means, Standard Deviations, and Univariate F-Ratios for Five Demographic Variables

Variable	High Math Concepts (n = 34)		Low Math Concepts (n = 30)		Univariate F-Ratio[a]
	Mean	S.D.	Mean	S.D.	
FAMSES	3.35	1.57	3.93	1.51	6.56 *
FAMSIZE	2.44	.89	2.77	1.07	.30
KRANK	1.11	.33	1.33	.48	2.38
COM/MODE HOM	1.74	.90	1.53	.86	.03
COM/MODE SCHOL	1.94	.24	1.73	.45	8.52 **

[a] Degrees of Freedom = 1, 63

* $p < .05$

** $p < .01$

math concepts group, children in the high math concepts group came from families whose parents had higher level occupations and educational attainment and in school used a non-oral communication mode. The direction of the group difference on FAMSES was predictable from earlier work while that of COM/MODE SCHOL was not due to lack of precedent. The univariate F's for the remaining three variables were not significant, however, the group means for FAMSIZE and KRANK were also in predicted directions. Again, the group mean difference on COM/MODE HOM is a "new" finding, therefore, not directly predictable from earlier work.

The analysis was computed over 30 low math concepts achievers and 34 high achievers. Three of the five variables entered the equation: COM/MODE SCHOL, FAMSES and KRANK. The overall Wilks lambda was .788 with an associated chi square value of 14.41 with 3 degrees of freedom significant at the .002 level and a canonical correlation of .460 for the discriminant function (see Table 16).

This solution explained 21.2% of the group variance and classified 72% of the cases used in the analysis correctly. Confidence intervals using the t-statistic ($t_{.01,62}$) and the standard error, were computed to examine the statistical significance of the 72% hit rate for math concepts. Since the 99% confidence interval ranged from 33.2% to 66.8%, the observed overall hit rate was statistically significant.

The improvement-over-chance index was calculated to be 44%; this means that 44% fewer classification errors resulted using this classification function based on the discriminating variables than would have by chance (i.e., 18 actual errors versus 32 expected by chance).

Table 16

Summary of Step-wise Discriminant Function Analysis[a] for Demographic Variables Predicting High and Low Achievers in Math Concepts

ep	Variable	Standardized Coefficients	Wilks Lambda	Change in Rao's V	Significance of Change in V	Within Structure Coefficient Function 1
	COM/MODE SCHOL	-.864	.918	5.50	.018	-.575
	KRANK	.428	.788	3.00	.083	.520
	FAMSIZE[b]	----	----	----	----	.441
	FAMSES	.764	.819	8.17	.004	.368
	COM/MODE HOM[b]	----	----	----	----	-.174

nonical Correlation = .46[illegible]

nonical R^2 = .212

ntroids: Math Concepts Highs = -.480
Math Concepts Lows = .543

rcent Correct Classification: Highs 68%
(Priors = .50) Lows 77%
Overall 72%

provement-Over-Chance Index: 44%

[a] Minimum F to Enter = 1.0

[b] This variable did not enter the equation

The within structure coefficients indicate that COM/MODE SCHOL and KRANK had the strongest relationships to the function. FAMSES was apparently sharing much of its contribution on the function (.764) with COM/MODE SCHOL since they had a large correlation (.449, see Table 17). The result of this high correlation is that the two variables were actually sharing discriminating information. Consequently, if only one of the variables had been used, its standardized coefficient would have been larger. However, both were used and both entered the equation and, even though FAMSES and COM/MODE SCHOL had fairly large standardized coefficients (made large contributions), their signs were in opposite directions so the contribution of FAMSES in this case is partially cancelled by the opposite contribution of COM/MODE SCHOL.

Similarly, since KRANK and FAMSIZE are highly correlated (.631), KRANK was interpreted as being comprised in part by FAMSIZE and was considered to signify a substantive relationship to the function. Note that the structure coefficient of FAMSIZE is .441. Interpreting the meaning of this function from the within structure coefficients clearly points out the true net effect of the individual variables on the function.

This function comprised primarily COM/MODE SCHOL and KRANK (FAMSIZE). The directionality of the high and low group means and the lack of apparent conceptual relatedness between the COM/MODE SCHOL and KRANK (FAMSIZE) variables suggest the function name reflect a combination of the presses in effect. Thus, the label, "Press for Simultaneous Communication Mode at School and Family Structure" was given to this function for high and low math concept prediction.

Table 17

Pooled Math Concepts Within-Groups Correlation Matrix for Five Demographic Variables

	FAMSES	FAMSIZE	KRANK	COM/MODE HOM	COM/MODE SCHOL
FAMSES	1.000				
FAMSIZE	.173	1.000			
KRANK	-.019	.631	1.000		
COM/MODE HOM	.133	-.006	-.148	1.000	
COM/MODE SCHOL	.449	-.046	-.123	.245	1.000

Math Computation - Demographic Variables Results

Table 18 displays the means, standard deviations and univariate F-ratios for each of the five predictor variables. No significant F-values were found. The directionality of the group differences on each of the variables, however, (except FAMSES) follows that of reading comprehension and math concepts.

A step-wise discriminant analysis using the same five demographic variables for math computation was conducted over 30 low achievers and 33 high achievers. As can be seen in Table 19 only KRANK entered the function. The analysis produced an overall Wilks lambda of .958 with an associated chi square of 2.58 with one degree of freedom significant at the .108 level and a canonical correlation of .204. This solution explained 4.2% of the group variation and correctly classified 61% of the cases in the analysis. For math computation, the hit rate of 61% did not differ significantly from chance. At the 95% confidence interval the hit rate would be statistically significant if it fell outside the interval of 50 ± 12.7 percent. After calculating the improvement-over-chance index it was found that 25 classification errors were committed using this classification rule versus 32 by chance or 22% = 1.

Although a discriminant function was constructed for high and low achievers in math computation, after consideration of the unacceptable statistical significance level, the very modest canonical correlation, the extremely high value of Wilks lambda and the relatively low and non-significant hit rate, it was decided the function lacked substantive importance and interest. It is suggested the variables did not discriminate between the high and low math computation groups substantively probably

Table 18

Math Computation Group Means, Standard Deviations, and Univariate F-Ratios for Five Demographic Variables

Variable	High Math Computation (n = 33)		Low Math Computation (n = 30)		Univariate F-Ratio[a]
	Mean	S.D.	Mean	S.D.	
FAMSES	3.67	1.74	3.63	1.40	.06
FAMSIZE	2.39	.97	2.80	1.06	.32
KRANK	1.21	.42	1.40	.50	2.66
COM/MODE HOM	1.76	.87	1.60	.89	.35
COM/MODE SCHOL	1.88	.33	1.80	.41	.50

[a] Degrees of Freedom = 1, 62

Table 19

Summary of Step-wise Discriminant Function Analysis[a] for Demographic Variables Predicting High and Low Achievers in Math Computation

ep	Variable	Standardized Coefficients	Wilks Lambda	Change in Rao's V	Significance of Change in V	Within Structure Coefficient Function 1
	KRANK	1.000	.958	2.66	.102	1.000
	FAMSIZE[b]	----	----	----	----	.731
	FAMSES[b]	----	----	----	----	.107
	COM/MODE SCHOL[b]	----	----	----	----	-.073
	COM/MODE HOM[b]	----	----	----	----	-.061

nonical Correlation = .204

nonical R^2 = .042

ntroids: Math Computation Highs = -.196
Math Computation Lows = .216

rcent Correct Classification:	Highs	79%
(Priors = .50)	Lows	42%
	Overall	61%

provement-Over-Chance Index: 22%

[a] Minimum F to Enter = 1.0

[b] This variable did not enter the equation

because the group centroids were in all likelihood not significantly distinct on these variables. That is, the hearing impaired children in the high and low math computation groups in this analysis probably had similar demographic characteristics as used in this analysis. Alternatively, if the groups were significantly different, the KRANK variable provided insufficient discriminating power to make the determination, i.e., was a weak discriminating variable.

Further discussion of math computation would be unproductive given the results of this discriminant analysis. Future research should study the overall impact of demographic variables on this academic area by developing alternative patterns of variables to be used in the analysis. Table 20, the correlation matrix, is provided for the reader's review.

Discussion of Results for Reading Comprehension and Math Concepts

Unlike the interpretation of the family environment variables and academic achievement discriminant analyses which took an "exploratory" approach, the interpretation of the demographic variables and academic achievement discriminant analyses takes a conservative approach. Thus, as indicated previously, the results of the math computation group analysis will not be interpreted. The primary interest in this study was to examine the family environment as it related to academic achievement. The relationship of demographic variables to academic achievement was examined for its own sake but primarily it was studied for comparative purposes; this is addressed in study question five. Also, even though discriminant analysis is a rather robust technique, a conservative approach is taken because the equal-interval level assumption applied to the mode of communication data in the demographic

Table 20

Pooled Math Computation Within-Groups Correlation Matrix for Five Demographic Variables

	FAMSES	FAMSIZE	KRANK	COM/MODE HOM	COM/MODE SCHOL
FAMSES	1.000				
FAMSIZE	.174	1.000			
KRANK	.107	.731	1.000		
COM/MODE HOM	-.036	.032	-.061	1.000	
COM/MODE SCHOL	.376	-.071	-.073	.284	1.000

variables is made with some speculation; this possible violation may have resulted in the accuracy and interpretation of the analyses being affected. Having cautioned the reader, the discussion of the results of the analyses of the reading comprehension and math concepts groups on demographic variables is based on a judgment that the solutions are moderately powerful (see Tables 13 and 16), and for comparative purposes later on in this report, will be interpreted here as having salience.

The results of these discriminant analyses indicated that it is possible to classify into groups and to discriminate, on the basis of certain demographic variables, between groups of 10-13 year old hearing impaired children, classified into one of two groups of high or low achievement in reading comprehension and math concepts. The dimensions along which these differentiations were made are of interest and can contribute to one understanding of deaf children.

A "Press for Simultaneous Communication Mode" was the overriding influence for predicting high and low group membership in reading and math concepts. Although FAMSES was in a strong position and entered both equations, its correlation with COM/MODE SCHOL reduced its unique discriminating influence. COM/MODE SCHOL was the more powerful and continued to be so as shown by its net effect on both functions. Its relationship to the functions would have, in all likelihood, increased had FAMSES not been used in either analyses. One might have reasonably expected FAMSES to maintain its power given what we know from years of SES research. Also, it has been shown that FAMSES indicators such as parental income, have consistently correlated with academic achievement in deaf students, i.e., as income increases there is a corresponding trend toward higher academic achievement (e.g., Rawlings & Jensema, 1977). The nature of discriminant analysis, however, to consider the simultaneous contributions of all the variables indicated that COM/MODE SCHOL had the most significant contribution on these functions and was most closely related to the functions in spite of the influence of another powerful variable namely, FAMSES. This means that the differences in COM/MODE SCHOL (with COM/MODE HOM for reading and KRANK for math concepts) were more powerful discriminators of high and low achievement than were the differences in FAMSES. From another perspective, this means that the high and low achievement groups were more different on the COM/MODE SCHOL variable than they were on FAMSES.

An examination of what the function, "Press for Simultaneous Communication Mode" might mean helps to interpret these findings for reading and math concepts. Three circumstances are probably true: 1) the high achievement groups' mean scores on COM/MODE SCHOL and HOM indicated a trend toward a "simultaneous" communication mode, 2) the majority of families in the study were hearing parents who do not use ASL, and, 3) the primary manual communication method used in Total Communication schools is some form of manual English. This leads to the proposition that another way to label or think about this press is that it is a press for some form of manual English used in a Total Communication environment. If this is true, then the finding for reading comprehension and math concepts achievement is partially supported in the literature indirectly by Brasel and Quigley (1977) who concluded that manual communication provided advantages over oral communication in early language development. As we know, language development is an area related to reading and the language-dependent math concepts area. Also, both findings--

for reading and math concepts--are supported by Babb (1979) who found that better academic achievement and language development were produced when a form of manual English, SEE II, which other research found tends to evolve into Pidgin Sign English (Marmor and Pettito, 1979), was used in both the school and the home.

Regarding the ordinal position (KRANK) influence on the function for math concepts, "Press for Simultaneous Communication Mode at School and Family Structure," an examination of the directionality of the high and low group means showed that the high achievement group comprised children, the majority of whom were first-born. This finding, i.e., that high achievers in math concepts were children who tended to be first-born versus later-born is fairly well supported by research on birth order effects of normally hearing children in the general population. For example, first-borns have been found by Altus (1966) to perform better than later-borns on measures of verbal ability (math concepts achievement is heavily dependent on language ability). No similar research on ordinal position effects is available in the area of deafness.

It was also concluded that the children in the high math concepts achievement group came from relatively smaller families than did low achievers. This conclusion was drawn from the directionality of the magnitude of the group means on FAMSIZE and from the fact that KRANK was correlated to FAMSIZE at a fairly high level (.631) for the cases used in this analysis. This meant that FAMSIZE shared a great deal of its discriminating power with KRANK. Although KRANK and not FAMSIZE entered the equation and was shown by the within structure coefficient to relate to the function, FAMSIZE was considered to be a noteworthy component of the KRANK contribution on the function. That this was in fact what occurred in the net effect can be seen from the relationship FAMSIZE had on its own to the function, .441.

The relation of family size to academic achievement has been studied for many years with unequivocal findings. Children from large families tend to perform more poorly on indices of academic achievement, I.Q., and verbal ability (Marjoribanks, Walberg, Bargen, 1975). There is a dearth of available research literature in this area in the field of deafness. However, the finding in this study that high achievers in math concepts were first- or early-born and are from small families seems to be consistent with findings based on the general population.

Overall, the pattern of discriminating power found in the five variables used in these analyses for reading comprehension and math concepts varied for the two content areas being predicted but the primary influence on the functions in both cases was a primarily simultaneous communication mode in school. For the high group in reading comprehension, a trend toward a simultaneous communication mode at school and at home were important predictors. The high achievers in math concepts came from simultaneous communication school environments and were early-born and from small families.

The finding that the hearing impaired children achieving high reading comprehension tended to use simultaneous communication modes at school and at home becomes richer and more meaningful when viewed in light of the family learning environment results for reading. It is suggested that a simultaneous communication mode might reflect increased interaction between parent and child (compared to a primarily oral mode) which would imply opportunity for richer and more numerous experiences and access to ideas. This is supported in a study by Greenberg (1980) that found social interactions were longer, more complex, and evidenced more cooperation and positive affect in simultaneous communication mother-child dyads than in oral dyads. Again, given that one of the component skills of reading comprehension involves exposure to experiences and ideas which social interaction introduces, it can be seen that a tendency toward a simultaneous communication mode could reasonably be expected to effect higher reading ability.

Quigley and Kretschmer (1982) raised this question concerning reading development: Whether the communication system used by deaf children can serve as a base for their development of reading. Their question is based on the fact that since reading is an auditorially based skill for hearing people, can a visual-gestural language system (ASL or some form of manual English) provide an effective base for the development of reading. The finding in this study that hearing impaired children who were high reading achievers used a simultaneous mode of communication at home and school prompts a positive response to Quigley and Kretschmer's query.

5. Which set of variables: Family environment characteristics or demographic characteristics, is the better predictor of the academic achievement of hearing impaired children?

The information in Table 21 gives the summary statistics from the discriminant analyses considered important in making a judgment regarding the relative substantive and utilitarian significance of family environment and demographic characteristics for predicting reading and math achievement.

If the researcher is interested in how well the discriminant function did in explaining group differences so that he/she can interpret the group differences in the variables, the canonical correlation squared should be

Table 21

Summary of Indicators of Significance from Discriminant Analyses for Family Environment and Demographic Variables Predicting Academic Achievement

Variable Set	Chi-Square	Significance Level	Wilks Lambda	Canonical R^2	Overall Hit Rate	Improvement-Over-Chance
READING COMPREHENSION						
Family Environment	17.0	.004	.723	.276	72% **	44%
Demographic	16.0	.003	.763	.251	71% **	42%
MATH CONCEPTS						
Family Environment	8.64	.07	.862	.138	65% *	30%
Demographic	14.41	.002	.788	.212	72% **	44%
MATH COMPUTATION						
Family Environment	10.36	.001	.837	.162	59%	18%
Demographic	2.38	.108	.958	.042	61%	22%

* $p < .05$

** $p < .01$

examined. Together with Wilks Lambda and the test of significance, which tells if the function is statistically significant, the canonical R^2 tells the substantive value of the function, i.e., how much of the group variation is explained by this solution. Then the researcher proceeds to examine the structure coefficients with the group centroids to study the multivariate differences between the two groups. Obviously, the higher the canonical R^2 is, the more meaning can be attached to this interpretation activity.

For the researcher whose primary interest is in a mathematical model which can predict well or serve as a reasonable description of the real world, the best guide is the percentage of correct classifications (Klecka, 1980), that is, the hit rate. This would suggest that of the two, the hit rate should be the primary criterion.

Table 22 gives the rank order listing of the solutions based on the canonical R^2 and the hit rate. The top three most powerful and accurate solutions are for all practical purposes in the same order in both lists. Of the three solutions, family environment variables came out on top as the most powerful and accurate set of predictor variables for predicting high and low reading comprehension group membership in this study. Demographic variables were also shown to derive meaningful, i.e., discriminating and accurate functions for predicting group membership in reading comprehension but they did so less well when compared to family environment variables.

If the hit rate is used as the ultimate criterion for judging the substantive and utilitarian significance of a discriminant solution, most researchers would consider the functions for either demographic or family environment variables predicting high and low math computation not significant. However, of these, the more interesting solution and one which

Table 22

Rank Order of Discriminant Analysis Solutions by Canonical R^2 and by Hit Rate

Rank Order	Discriminating Variables	Achievement Groups	Canonical R^2	Rank Order	Discriminating Variables	Achievement Groups	Hit Rate
1	Family Environment	Reading Comprehension	.276	1	Family Environment	Reading Comprehension	72%
2	Demographic	Reading Comprehension	.251	2	Demographic	Math Concepts	72%
3	Demographic	Math Concepts	.212	3	Demographic	Reading Comprehension	71%
4	Family Environment	Math Computation	.162	4	Family Environment	Math Concepts	65%
5	Family Environment	Math Concepts	.138	5	Demographic	Math Computation	61%
6	Demographic	Math Computation	.042	6	Family Environment	Math Computation	59%

has potential exploratory value (if we were willing to be a little less conservative) is the function for family environment predicting math computation.

It was fairly clear in this study that the two functions derived for predicting high and low math concepts achievement based on demographic and family environment variables were both moderately powerful and accurate. Of the two, the function for demographic variables was the better on every indicator.

The purpose of comparing the discriminating accuracy and power of demographic and family environment variables in predicting high and low academic achievement was to select the "better" function. It was found that for reading comprehension, family environment variables derived a better solution but the solution based on demographic variables was almost as effective. For math concepts, demographic variables clearly explained more of the group differences than did the family environment variables. And neither set of variables did that well in deriving a function that could explain math computation achievement group differences although the family environment variable seemed to hold the most promise and interest as a set of discriminating variables if the accuracy of the hit rate could be bumped up.

It is suggested that the differences in the discriminant functions using family environment variables or demographic variables for predicting reading comprehension group membership may be equivocal. The fact that both worked fairly well enables a richer, more thorough understanding of the characteristics influencing achievement of hearing impaired children in this area. Also, and more importantly, the family environment function identified information about interactions and parent-child behaviors that intervention can perhaps influence rather than identifying classification-type information (e.g., FAMSES) about which little can be done to change.

Although the analyses predicting math concepts achievement differences resulted in the demographic variables deriving a better solution than family environment, the fact that family environment variables also derived a moderately powerful solution provides access to greater understanding, and again, the opportunity to intervene in areas in which change in a desired direction can be effected.

If the overall goal is to derive a model that both predicts and explains group membership and does it well then it is proposed here that a set of combined family environment and demographic variables be used for the analysis. Given the potentially complementary nature of the two "Presses" or functions operating for reading comprehension, i.e., "Press for Interactive Child-Rearing" and "Press for Simultaneous Communication," it is reasonable to expect an even more discriminating and accurate solution to result if the two variables from each function, that were most related to the function and on which the functions ("Presses") were named were used in a discriminant analysis for predicting reading comprehension groups. This same procedure could be employed in an attempt to derive a better model for predicting and explaining high and low math concepts achievement. An alternative pattern of the best (from this study's solutions) of both family environment and demographic variables could be used in a discriminant analysis. One cautionary note: Independence of family environment and demographic variables would need to be examined.

6. Do family learning environments of hearing impaired children differ from family learning environments of hearing children?

This discussion of family environments of deaf and hearing children at this point can only be based on qualitative comparisons rather than statistical tests of differences. Although the research in this study was conceptually compatible in design and methodology to Dave (1963) and Marjoribanks (1979), none were replication studies. However, there is much merit to examining the findings for corresponding differences as well as for similarities.

The following discussion compares findings resulting from two types of research procedures: 1) the procedure for identifying the family environment; and 2) the procedure for relating the family environment to school learning.

The first task for Dave (1963), Marjoribanks (1979) and this study was to derive a valid representation of the family environment. Dave drew from theory and research to identify six family environment variables and their identifying characteristics. Each characteristic was measured and a family environment index was, thus, obtained. Dave's overall result was that the correlation of the Index of Educational Environment, obtained from the simple addition of the scores on the characteristics defining the six variables, and the total academic achievement scores was .799. In an attempt to further refine the representation of the family environment, Marjoribanks and this study performed factor analysis on the large number of interview variables (characteristics in Dave's terminology), also derived from earlier work, and reduced the data to six constructs which represented the family environment. A comparison of the compositions of the family environment constructs and variables among the three studies follows.

Since this study's interview items were based on those Marjoribanks used in his study on family and school environmental correlates of intelligence, personality and school related affective characteristics which he discussed and reproduced in his text (1979) on the empirical analysis of families and their learning environments, it is interesting to compare the results of his factor analysis solution to the one derived in this study on the basis of number of factors, the variables each factor comprised and their labels. That study produced a six factor solution which was discussed earlier in this report under the "Method" section. The factor scales were labeled: Parents' expectation for the child, Expectations for themselves, Concern for the use of language within the family, Reinforcement of educational expectations, Knowledge of child's educational progress, and Family involvement in educational activities. Of course, for comparison purposes, any additional items related to deafness, communication or any topic which were added to the interview schedule were excluded from the comparison. Specifically, this comparison excluded the 18 deafness-related variables and those in this study's factor 4: Parents' satisfaction with child's schooling, none of which Marjoribanks used.

Examination of the nature of the variables (interview items) determined by this six factor solution relative to Marjoribanks' items in his six factor solution showed that while some variables changed factor position, most were retained in the solution under the $>.30$ criterion. The exception to this is Marjoribanks' factor 2: Parents' aspirations for themselves. Only the "Parents' occupational level" and "Parents' job satisfaction" items were retained (VAR 173, 174) in this study's factor 5. This is understandable given the other items in his factor 2 are classifications of education and occupational levels of people not in the home.

This means that the Family Environment of Deaf Children Instrument measured similar characteristics or interactions of the family as did Marjoribanks' instrument but they were influenced by slightly different constructs or factors. This study's factor names reflect this difference but it is suggested the reader note the conceptual overlap (or complementarity) of this study's factors 1 and 6 with Marjoribanks' factors 3, 5 and 6. This is also true for this study's factor 2 and Marjoribanks' 1 and 4.

Making a similar comparison of the variables in Dave's study and this study's constructs, the most interesting comparison because of the substantive similarity is Dave's Achievement press and this study factor 2 construct, Parental aspirations for child's academic and occupational achievements (later labeled Press for Achievement at the family learning environment analysis stage). Five of seven of the characteristics identifying the Achievement press variable were similar to those which identified the factor 2 construct. All of the characteristics under Dave's Language models variable and one characteristic under Academic guidance were similar to those items which loaded on factor 1 in this study. The characteristics under Activeness of the family were similar to those which loaded on factor 6 in this study. The characteristics under Dave's fifth and sixth variables had no similar items in this study so were not examined further.

Again, in a general sense, this means that the Family Environment of Deaf Children Instrument has conceptual overlap with previous research using this approach to study family environments. This lends credibility and a sense of the validity of the method. The differences that are observed are reflected in the factor names. Table 23 presents a listing of the construct or variable names that represented the family environment in each of the three studies.

The remainder of this discussion will focus on comparing the findings derived from relating family environment to academic achievement. As already mentioned, Dave found a high correlation (.799) between his family environment index and academic achievement. More specifically he found Achievement Press and Activeness in the family to be most highly correlated with reading. This supports the discriminant analysis results in this study that found factor 6, Child-Rearing Orientation (similar to Activeness in the family) to be a powerful predictor of high and low readers. The findings for math computation and math concepts were less similar and given the general nature of this discussion, will not be compared.

Marjoribanks used regression analyses to identify which family environment factors predicted which areas of academic achievement. The complex nature of Marjoribanks' findings prevents parallel comparison between studies. For example, his studies having most relevance here examined the nature of the interaction between status characteristics (e.g., fathers' occupation and birth order), academic achievement and/or family environment (and/or intelligence). His findings indicate the importance of considering both status characteristics and family environment measures for a more complete understanding of the variation in children's academic achievement. At each social-status level (from low to high), he found increases in family environment scores (from low to high) were related to increments in English achievement scores; and at each level of family environment, increases in social-status were associated with increments in English performance

Table 23

Listing of the Family Environment Constructs Derived for Three Studies

Dave (1963)	Marjoribanks (1979)	Bodner-Johnson (1983)
1. Achievement press	1. Parents' expectations for the child	1. Concern for school progress and the use and development of language and communication
2. Language models	2. Parents' expectations for themselves	2. Parental aspirations and expectations for child's academic and occupational achievements
3. Academic guidance	3. Concern for the use of language within the family	3. Integration of hearing impairment into the family environment
4. Activeness of the family	4. Parents' reinforcement of educational expectations	4. Parents' satisfaction with child's schooling
5. Intellectuality in home	5. Knowledge of child's educational progress	5. Parents' aspirations for work and leisure
6. Work habits in the family	6. Family involvement in educational activities	6. Child-rearing orientation

(Marjoribanks, 1979). In another study, Marjoribanks (1976) found that increases in math achievement were related to more favorable family environments at different family size levels but that math achievement was not related significantly to increases in family size at different family environment levels. For English achievement, however, he found at each family size level, increments in family environment were related to increases in English achievement and also that increments in family size were associated with decrements in English at different environment levels.

The findings of the research on the family learning environments of deaf children like that on family learning environments of hearing children showed that if both status characteristics and family environment constructs were considered, a more enriched and valid understanding of the deaf child's academic achievement was gained. Although differences of analytic procedures prevent direct parallel comparison, the overall directionality of the findings for family learning environments for deaf and hearing children is shared. For example, it appears that smaller families and first- or early-born children whether hearing or deaf under certain family environment conditions are likely to do better in English achievement and math achievement respectively. It is probably the case that the magnitude of the COM/MODE variables for reading overcame the strengths of the contribution of the family socio-economic level variable. COM/MODE SCHOL and HOM are unique variables to this study and derive from the nature of the population under study. It was suggested in the results that FAMSES might be an important contributor along with certain family environment constructs labeled "Press for Interactive Child-Rearing" for reading. If this assumption were made, this would be supported by the overall findings from Marjoribanks' work.

This study showed that for deaf children from 9.5 to 13 years of age, differences in the quality of certain constructs of the family environment predicted differences in academic achievement. Differences in certain status characteristics also predicted differences in academic achievement. The nature of the differences in the environmental and status characteristics indicated that the directionality as well as the overall quality of most of the predictor variables are supported by family learning environment research conducted with young adolescent hearing children.

That this study had findings unique to those in the literature of family learning environments was expected due to the characteristic of hearing impairment in the sample. These findings were related to the derivation of new family environment constructs (factors) and to new patterns within factors. Also, these new family environment constructs were identified as significant predictor variables for reading, i.e., Integration of Hearing Impairment into the Family. Finally, status characteristics other than the expected socio-economic status were found to be significant predictors of reading and math concepts.

Summary, Conclusions and Implications

Summary of Major Findings

The results of this study can be summarized as follows:

1. The overall family environment of hearing impaired children was found to consist of constructs, the compositions of which were generally consistent or compatible to those reported by family environment research with hearing children. Unique constructs of the family environment of hearing impaired children were also derived as were unique components of some constructs. Thus, it can be concluded that the inclusion in the family of a hearing impaired child is a relevant factor influencing the overall family environment.

2. Generally, the correlation of the overall family environment and academic achievement was not consistent across levels of status characteristics.

2a. Of the three academic areas, the family environment and reading comprehension relationship was most often effected by differences in levels of status characteristics.

2b. Of the status characteristics levels examined, the family environment and academic achievement correlation was most influenced in order of magnitude by: communication mode generally used in the school, I.Q., family size and student type with a trend found for sex.

2c. Of the status characteristics that influenced the relationship between family environment and academic achievement, the influence was differential across academic areas and across levels of the characteristics.

3. The predictions of family learning environment theory have been supported in part as evidenced in the finding that generally a more favorable family learning environment predicted high achievement in hearing impaired children in academic content areas. It was found that different constructs of the family environment predicted different academic areas; also the power and accuracy of the environment to achievement prediction functions varied with the solution for reading comprehension being overall better than those for math concepts and math computation.

3a. A "Press for Interactive Child-Rearing" dimension of the family environment, comprising particular parent-child interactions, behaviors, and beliefs about child-rearing and about hearing impairment, was found to predict high and low achievement in reading comprehension with the high achievers coming from the more interactive families.

3b. A "Press for Directiveness" dimension, comprising certain parental behaviors regarding the child's school progress, language and communication described as "directive," was found to predict high and low math concept achievement with the high achievers coming from the less directive families.

3c. A "Press for Achievement" dimension of the family environment, comprising parental aspirations and expectations for their child's academic and occupational achievements, was found to predict high and low achievement in math computation with high achievers coming from families who have higher aspirations and expectations.

4. The high and low achievers in math concepts and math computation tended to have families with less variability on their predictive environment

constructs than high and low achievers in reading comprehension; the family learning environment was better able to discriminate high and low reading achievement than it was math achievement and especially math concepts achievement. The family learning environment, it can be concluded, is a relevant factor influencing reading achievement to a greater degree than math achievement.

5. The predictions wrought by years of research on demographic characteristics and achievement were not fully supported as evidenced by the finding that the typically powerful predicting ability of family socioeconomic status for academic achievement was not found for this sample of high and low achievers in math and reading. Rather, it was found that in moderately powerful and accurate solutions, communication mode used by the child in the home and/or school were the most influencial variables for predicting high and low achievement in both reading comprehension and math concepts. Family structure was also a discriminating variable for achievement in math concepts.

5a. Children who were high achievers in reading tended to use a simultaneous mode of communication at home and at school, i.e., they were not in an oral-only environment in either setting.

5b. Children who were high achievers in math concepts tended to use a simultaneous mode of communication at school and also came from smaller families and were early-born.

6. The demographic variables, in order of the power and accuracy of the solutions, predicted high and low achievement better in reading comprehension than they did in math concepts (and had limited merit for predicting achievement in math computation). Certain demographic variables, it can be

concluded, are worthy of consideration as factors contributing to achievement in reading comprehension and specific math content areas.

7. Overall, family environment variables were found to be the better predictors of academic achievement than were demographic characteristics. By academic content area the findings regarding the relatively better set of predictors were differential: Family environment predicted reading comprehension, demographic characteristics predicted math concepts and family environment predicted math computation. For reading and math concepts, the nature of the demographic and family environment predictor variables were complementary and can likely enrich understanding of achievement in these academic areas. This is supported by family learning environment research done with hearing children.

Conclusions

This study built on a line of theory (e.g., Lewin, 1934; Murray, 1938; Bloom, 1964) based on the concepts of person-environment-behavior interaction, environmental "presses," i.e., the environment has magnitude and directionality, and specific sub-environment to characteristic-development relationships. This study was operationalized following the family environment measurement concepts and techniques modeled by the research of Dave (1963) and Marjoribanks (1979) but making adaptations to accommodate a hearing impaired sample and possibly hearing impaired parents.

It can be concluded that the conceptual and methodological bases on which this study was constructed were upheld. Family environment characteristics, similar and compatible with earlier work done with hearing children, were identified to represent the hearing impaired child's family environment. At the same time, however, the basic argument that the family environments of hearing impaired children would also be different due to the presence of the child in the family was supported as evidenced by the derivation and salience of a family environment construct unique to this special population: Integration of hearing impairment into the family and the emergence of "sub-clusters" of deafness-related variables on several constructs (see especially SCHLANCOM). The theoretical conceptualizations were finally proven when, along with the "hearing-related" environment constructs, the "deafness-related" environment constructs were found to predict academic achievement.

The obtained predictive relationships between family environment and academic achievement were substantively as well as statistically significant. When demographic variables were considered, the family picture became more complex, but more in focus, and certainly more enriched.

Families with deaf children who read well, read to their children at an early age, spent more time interacting with their children exposing them to new and varied experiences and ideas, allowed their children greater independence and were not then traumatized by their children's hearing loss. They also tended toward the use of a simultaneous mode of communication with the child at home and enrolled the child in a school program in which the mode of communication is primarily simultaneous.

Children who did well in math computation and concepts had parents who had high expectations for their child's future and plans in place to assist that attainment; they reinforced their child's school efforts while tending to show less concern for the more specific, day-to-day school issues and less interest in a "teaching" role regarding the child's language. The high-math children, especially math concepts, tended to be in a simultaneous communication mode school environment and to be early-born and from smaller families.

The "Press for Directiveness" behaviors involving parental concern for the hearing impaired child's school progress, use and development of language and communication was found to have a negative influence on achievement in math concepts. This finding is not supported by evidence from family environment research with hearing children. This dimension of the family environment, it is concluded, holds particular allure for further study.

The results of this study increased our understanding of the relationships between family environment-child interactions and academic achievement by showing that it does make a difference how parents behave with their children. One of the major findings is that the obtained relationships are dependent on the academic content involved. The differential relationships found between reading and math achievement signify the complex nature of the learning process in these content areas. This does not mean generalizations regarding the influence of family learning environments are not possible but it does highlight the need for research being conducted to help explain the unaccounted for variance.

The key family learning environment dimensions across all three academic content areas seem to reflect a perception of the deaf child as a competent individual for whom expectations are high, with whom interactions are frequent and a mutual effort is made to attain understandable communication. Whether by design or chance these families are practicing what has been shown to be good child-rearing methods.

The reason this study sought to interpret the demographic characteristics along with the family environment characteristics is based on the belief that inter-relationships exist between a broad range of status characteristics, social-psychological family environment variables and children's academic achievement. This concept of a network of forces effecting academic achievement provided an essential framework for thinking about the results of this study.

The findings of the present study show that the methodology applied for family environment measurement is likely to prove successful in explaining a substantial proportion of the variability in the math and reading achievement among 10-13 year old deaf children. Future analyses will be conducted in an effort to refine the environment measure and, thus, to enhance its predictive ability. Continued effort to measure communication competency of parents and child should embellish the structural analyses of environments especially given the significance attached to communication mode in this study.

Implications of the Research for Practitioners

The following discussion will address the practical implications of this research project for teachers, administrators and parents.

First, the results of this study should sensitize practitioners to the significant and specific role of the family learning environment. There is reason to recommend that practitioners develop systematic efforts to visit the homes of hearing impaired students on an ongoing basis, and to interact with the parent(s) in the home, in order to gain information leading to greater understanding of the individual child's family experiences. This, in turn, provides the basis for the development of a plan, worked out by parents and teachers, to maximize (within any given family's constraints) the family environment. These procedures should be incorporated into any comprehensive intervention program.

The findings regarding the significance of specific dimensions of the family environment for school achievement have direct implications for educational and clinical practitioners and parents. Since it was found, for example, that better readers have parents who hold certain child-rearing orientations and have adapted to their child's deafness, in working with parents the practitioner should strive to identify the parents beliefs (personal constructs) regarding their child as a person and his/her abilities and potential as a member of society. Helping parents extend their perspectives and skills and/or gain more realistic views may provide an appropriate introduction to intervention and may initiate a trend in the family toward more productive parent-child interactions.

The implications of this research for those working with hearing impaired children is clear. Since a "Press for Interactive Child-Rearing" and a "Press for Achievement" did predict high academic achievement, classroom teachers might be encouraged to incorporate these findings into their own practice. The negative outcomes of a "Press for Directiveness" have been identified suggesting to teachers for the first time perhaps that we need to examine closely the accepted principles and beliefs by which we operate. That is, what we perceive we are doing may be interpreted by the child as a negative force and may not have the desired end effect.

Teacher preparation programs, both pre- and in-service need to be made aware of: 1) the nature of the social-psychological processes that operate in families to affect children's academic achievement; 2) the skills and knowledge necessary to develop adult-centered curricula; and 3) the possibilities, but also the difficulties, in attempting to affect family characteristics such as parents' expectations, the parent-child interaction level within the family, or parents' beliefs about their child.

There is the possibility that it would be financially and administratively expedient to pass over the findings of this research. It is considered desirable that classroom teachers, who are willing and skilled participants, (including parent-infant teachers) rather than specially trained professionals, who are not involved with daily or frequent classroom activities, be the people involved in the interaction with parents. For administrators (and teachers), this means a number of changes will need to occur: time schedules will be revised, teachers will be accountable and paid for activities off campus, more parents will be coming to the school and becoming involved in, heretofore, school-centered decisions and, ultimately, there will be new budget demands. For teachers too, developing programs with/for parents is a difficult task and not easy to initiate and maintain. However, in the many interviews with parents conducted by this researcher, there usually was genuine interest in parents to talk about their children's education and family life. The parents felt they had lost the contact with the school they once enjoyed when their child was younger. They were eager and able to offer information and to learn more about the quality of their child's schooling. The task is to transform these parental interests and beliefs into behaviors and to convince parents (and teachers) that the investment of family-school cooperation will be related to gains in the child's academic achievement.

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APPENDIX A

FAMILY ENVIRONMENT OF DEAF CHILDREN INSTRUMENT

FAMILY ENVIRONMENT OF DEAF CHILDREN INSTRUMENT

To the parents: The present set of questions is part of a study examining relationships that exist between families and the schools to which families send their children.

We would like to obtain some information from you regarding your feelings about the school your child (name the child) attends and to find out some of your thoughts about education in general. It is hoped that the kind of information that is collected in the study will be used by schools when they are planning their programs. As you know, we are also interested in x's academic, social-emotional, and intelligence data. (In some cases, we seek permission from you to collect or access that data from the school).

The research guarantees anonymity of the family and confidentiality of all responses.

Many questions ask for an individual response from each of you as mother and father of x. Your separate, personal beliefs and opinions are important to us. When you have responses different than your spouse's, please feel comfortable in emphasizing them for me.

It is essential to have a very accurate response to each question. However, if you feel that a question is an invasion of your privacy, feel free not to answer it. We would rather have no response to some questions than responses that do not reflect your real feelings.

If you think I am not understanding what you mean by your response, please tell me. We need to discuss it. Again, we hope to record accurately the information you provide.

The first set of questions deals with certain aspects of the family. We ask them in order to provide some general information for the study. Then the following questions are about your child (name the child) and the school she/he attends. Your answers should be related to (name the child).

To the interviewer:

(a) Each question should be asked of all parents, except where it is obvious from a previous answer that a question doesn't apply.
(b) Where a question is asked of both mother and father, record each of their responses separately.
(c) The questions are associated with numbers. Place a circle (not a tick) around the number which is closest to the answer supplied.
(d) For most questions, allow parents to respond freely. However, it may be necessary to clarify by probing so our information is accurate. Some questions require you to read response choices to parents.
(e) In the questionnaire, whenever x appears please substitute the child's name.
(f) An 'other answer' space is provided for most questions. If the responses that are given do not fit easily within the categories that are supplied then write in the response. Also please supply any comments you feel might be useful when the schedule is being scored.
(g) Oral mode of communication refers to the use of speech, residual hearing and speechreading; simultaneous mode of communication refers to the use of speech, residual hearing and lipreading plus one of the artificial or constructed manually-coded English sign languages.
(h) American Sign Language (ASL) refers to the standard variant within the manual communication system(s) having a linguistic code with its own rules not necessarily those of a formal English system, e.g., Ameslan. Usually communication in Ameslan relies minimally on oral input with the exception perhaps of speechreading.

Family Environment Schedule: Part A

1. Date of interview:

2. Name of interviewer:

3. Surname of family:

4. First name of child:

5. Sex of child: M F

6. Date of birth of child:

7. Address: #Street:
City, State, County:
Zip:

8. Phone:

9. Race/ethnicity: (Do not ask)
   1. White
   2. Black
   3. Spanish American (Spanish surname or Spanish speaking)
   4. Oriental (Asian-American)
   5. American Indian
   6. Other ________________
   7. Unknown

10. Type of dwelling: (Do not ask)
    1. One-family house detached
    2. One-family house attached
    3. Mobile home or trailer
    4. Boat, van, tent, etc.
    5. Apartment with ____ units

11. Age at the time of diagnosis:

12. Neighborhood: (Do not ask)
    1. UU 4. UM 7. UL
    2. MU 5. MM 8. ML
    3. LU 6. LM 9. LL

13. Age when received hearing aid(s):

14. Age at entrance into parent-infant or school program:

15. Length of interview: time started:

    time completed:

16. School currently attended by child (name, city, state):

17. Type of school program (circle appropriate number):

residential school	1
day school	2
special class in regular local school	3
regular local school with a resource room	4
regular local school program	5

18. x is a:

residential student	1
commuter student	2

19. The teacher x spends most of the school day with is:

hearing	1
deaf	2
hard of hearing	3

20. x is mainstreamed (circle all that apply):

not at all	1
for physical education and lunch	2
for some academic subjects	3
for most academic subjects	4
for all academic subjects	5
Other (specify)	6

21. What special services does x receive? (circle all that apply):

none	1
special language training	2
speech/auditory training	3
special academic tutoring	4
all (x is in a special school)	5
Other (specify)	6

22. Who was interviewed (circle appropriate number):

mother	1
father	2
both parents	3
Other (specify)	4

23. a. What is the hearing status of parents and others (not siblings) in household:

	father	mother	others (specify who)
deaf	1	1	1
hearing	2	2	2
hard of hearing	3	3	3

b. What is the family status:

1. intact; both parents live at home
2. divorced; single parent
3. divorced, reconstituted
4. other

24. In what country was the mother, father and x born?:

	father	mother	child	other
United States	1	1	1	1
Other country (name)	2	2	2	2

25. If the parents or child were not born in the United States, in what year did they arrive?

1. father: 2. mother: 3. child:

26. What language is generally spoken/used in the home?

English	1
ASL	2
Other (specify)	3

27. What mode of communication is generally used in the home?

oral	1
simultaneous (oral and manually coded English)	2
primarily manual (as with ASL)	3

28. What mode of communication is generally used in x's school?

oral	1
simultaneous	2
primarily manual	3

29. When you are communicating/speaking with x what language would you use most of the time?

	father	mother
English	1	1
ASL	2	2
Other language (specify)	3	3

30. When you are communicating with x what mode of communication would you use most of the time?

	father	mother
oral	1	1
simultaneous	2	2
primarily manual	3	3

31. When x is talking/communicating with brothers or sisters or with other children in the home what language does x generally use?

English	1
ASL	2
other language (specify)	3

32. When x is communicating with brothers or sisters or with other children in the home what mode of communication does x generally use?

oral	1
simultaneous	2
primarily manual	3

33. How satisfied would you say you are with the school that x attends?

very satisfied	1	very dissatisfied	4
reasonably satisfied	2	don't know or don't care	5
not really satisfied	3	other answer (specify)	6

34. How do you react to the following statements about x's school: would you 1) agree strongly, 2) agree, 3) don't know, 4) disagree, 5) disagree strongly? Read the response choices.
In the school x attends:

		agree strongly	agree	don't know	disagree	disagree strongly	does not apply
a.	There is not enough homework	1	2	3	4	5	6
b.	There is not enough discipline	1	2	3	4	5	6
c.	Children are very friendly	1	2	3	4	5	6
d.	Too much time is spent on subjects such as art, music, drama	1	2	3	4	5	6
e.	Not enough time is spent on reading	1	2	3	4	5	6
f.	Not enough time is spent on mathematics	1	2	3	4	5	6
g.	Teachers are very friendly	1	2	3	4	5	6
h.	Teachers seem to treat all children fairly	1	2	3	4	5	6
i.	Teachers seem to be very interested in x's education	1	2	3	4	5	6
j.	The methods of teaching seem to be too progressive, too modern	1	2	3	4	5	6
k.	Too much time is spent on special courses for hearing impaired children such as speech and auditory training	1	2	3	4	5	6
l.	Teachers give impression that they want to keep parents out of the school	1	2	3	4	5	6
m.	Children from different ethnic groups mix very well	1	2	3	4	5	6
n.	Children who are deaf and hearing mix very well	1	2	3	4	5	6
o.	We don't receive enough information about how x is performing at his/her school work	1	2	3	4	5	6

35. How often does x use his/her hearing aid at home?

all the time	1	rarely (less than ½ the time)	4
most of the time (over ½ the time)	2	never or hardly ever	5
sometimes (½ the time)	3	other (specify)	6

36. From what you know, how often does x use his/her hearing aid at school?

all the time	1	never; hardly ever	5
most of the time	2	don't know	6
sometimes	3	other (specify)	7
rarely	4		

37. From what you know, how useful is x's hearing aid(s) for his/her use of residual hearing?

very useful	1	not at all useful	4
reasonably useful	2	don't know	5
not really useful	3	other (specify)	6

38. Do you notice x's consistent use of his/her hearing aid(s) for particular fuctions in the home? Read the responses.

meal time	1	helping ("working") around the house	6
family discussions	2		
story telling	3	uses all the time	7
play time (alone)	4	no	8
play time (with others)	5	other (specify)	9

39. i. Into which of the following school situations do you think deaf children who are about 11 years old should be placed? (Ask the question in two parts: first in relation to deaf children with hearing parents; and second, for deaf children with deaf parents.)

Read the Alternatives:	Deaf child with hearing parents	Deaf child with deaf parents
a. Residential schools for the deaf	1	1
b. Day schools for the deaf	2	2
c. Regular school but in a special class for deaf (self-contained)	3	3
d. Regular school with a resource room (mainstreamed appropriately)	4	4
e. Regular local school (fully mainstreamed)	5	5
f. Other (specify)	6	6

ii. When deaf children start school: parent-infant, preschool, first grade, into which of the following school situations do you think they should be placed? (Ask the question in two parts: first in relation to deaf children with hearing parents; and second, for deaf children with deaf parents.)

Read the Alternatives:	Deaf child with hearing parents	Deaf child with deaf parents
a. Residential schools for the deaf	1	1
b. Day schools for the deaf	2	2
c. Regular school but in a special class for deaf (self-contained)	3	3
d. Regular school with a resource room (mainstreamed appropriately)	4	4
e. Regular local school (fully mainstreamed)	5	5
f. Other (specify)	6	6

40. When deaf children start school: parent-infant program, preschool, first grade, in what language and what mode of communication do you think the children should be taught? (Ask question in two parts: first, in relation to deaf children with hearing parents; then, for deaf children with deaf parents.)

Read the Alternatives:	Deaf children with hearing parents	Deaf children with deaf parents
Language:		
English	1	1
ASL	2	2
Other (specify)	3	3
Mode:		
Oral	1	1
Simultaneous	2	2
Primarily Manual	3	3
Other (specify)	4	4

41. When deaf children reach the age of 10 or 11 years, in what language and what mode of communication do you think the children should be taught? Ask question in two parts: first, in relation to deaf children with hearing parents; then, for deaf children with deaf parents.

Read the Alternatives:	Deaf children with hearing parents	Deaf children with deaf parents
Language:		
English	1	1
ASL	2	2
Other (specify)	3	3
Mode:		
Oral	1	1
Simultaneous	2	2
Primarily Manual	3	3
Other (specify)	4	4

42. If a regular public school has a large number of deaf children, how much effort should be made to teach the hearing children and regular teachers "sign language" and to provide them with information about deafness and deaf people? (Read responses to parents)

a. an on-going school-wide, programmatic effort with participation required	1
b. an on-going school-wide, programmatic effort with participation optional	2
c. a sporadic effort, workshops and other inservice or lyceum-type activities, participation required	3
d. a sporadic effort, workshops and other inservice or lyceum-type activities, participation optional	4
e. no effort	5
f. Other (specify)	6

43. At x's school, from what you know, how would your rate the teaching of the following subjects: 1) very good, 2) good, 3) don't know, 4) poor, 5) very poor. Read the responses and force a choice.

		very good	good	don't know	poor	very poor	N/A
a.	Mathematics	1	2	3	4	5	6
b.	Reading	1	2	3	4	5	6
c.	English (literature)	1	2	3	4	5	6
d.	Physical Education	1	2	3	4	5	6
e.	Social Studies (history, geography)	1	2	3	4	5	6
f.	Art	1	2	3	4	5	6
g.	Music	1	2	3	4	5	6
h.	Speech Training	1	2	3	4	5	6
i.	Auditory Training	1	2	3	4	5	6
j.	Language (English)	1	2	3	4	5	6
k.	Language(ASL)	1	2	3	4	5	6
l.	Science	1	2	3	4	5	6

44. At home, how would you rate the level of understanding in the communication process: 1) very high, 2) high, 3) don't know, 4) low, 5) very low. (Complete for mother and father both). Read the responses and force a choice.

		very high	high	don't know	low	very low	N/A
a.	between x and mother	1	2	3	4	5	6
b.	between x and father	1	2	3	4	5	6
c.	between x and sibling(s)	1	2	3	4	5	6
d.	between x and others in the home (specify)	1	2	3	4	5	6

45. At x's school, from what you know, how would you rate the level of understanding in the communication process: 1) very high, 2) high, 3) don't know, 4) low, 5) very low. (Complete for both mother and father). Read the responses and force a choice.

		very high	high	don't know	low	very low	N/A
a.	between x and teacher(s)	1	2	3	4	5	6
b.	between x and other deaf children	1	2	3	4	5	6
c.	between x and other hearing children	1	2	3	4	5	6
d.	between x and other (specify who)	1	2	3	4	5	6

46. Do you have a decoder for your television?

1. Yes 2. No

47. a. How many children are in the family (including the deaf child)?
1 2 3 4 5 6 7 8 9 10

b. Then ask:

1. What are their ages (listing from eldest to youngest, including x)?
2. Are they deaf or hearing?
3. Where do the children live, at home or away?
4. Are they male or female?
5. What are their expected occupations if the children are still in school (elementary or secondary)? (fill in later for deaf child)
6. What is the child's present occupation if the child has left school (put university or college, if attending a post-secondary institution, #2)

Complete the following table (include the deaf child):

Child number	Age of child	Hearing Status			Residence		Sex		Expected occupation	Present occupation
		D	H	HH	Home	Away	M	F	name: rating	name: rating
1		1	2	3	1	2	1	2		
2		1	2	3	1	2	1	2		
3		1	2	3	1	2	1	2		
4		1	2	3	1	2	1	2		
5		1	2	3	1	2	1	2		
6		1	2	3	1	2	1	2		
7		1	2	3	1	2	1	2		
8		1	2	3	1	2	1	2		
9		1	2	3	1	2	1	2		
10		1	2	3	1	2	1	2		

48. For the purpose of this study, we need to have a rough indication of the income of your family. In which of these groups did your total family income, from all sources, fall last year--before taxes? Just tell me the number of the group. Hand card to parents. Circle number on interview form.

1. $0 - $9,999
2. $10,000 - $14,999
3. $15,000 - $19,999
4. $20,000 - $24,999
5. $25,000 - $29,999
6. $30,000 - above
7. refused

Family Environment Schedule: Part B

Interview Questions

1,2. How much education do you want x to receive?

Mother	Father	
1	1	postgraduate education (a higher degree): Ph.D., M.A. (beyond 4 years of college/university)
2	2	graduate from university (a first degree): B.A. (4 years of college/university)
3	3	at least some university or college
4	4	high school plus some other professional training (printer, secretary, artist, nurse, ...)
5	5	finish high school, or as much school as possible
6	6	leave school as soon as possible
7	7	other answer:

3,4. How much education do you really expect x to receive?

Mother	Father	
1	1	postgraduate education
2	2	graduate from university
3	3	at least some college or university
4	4	high school plus professional training
5	5	finish high school, or as much as possible
6	6	leave school as soon as possible
7	7	other answer:

5,6. How long have you had these ideas about the amount of education you expect x to receive? Probe for accuracy.

Mother	Father	
1	1	since x was born
2	2	before x started school (preschool or kindergarten)
3	3	just after x started school (preschool or kindergarten)
4	4	since last year
5	5	just this year

7,8. What kind of job would you like or want x to have when she/he grows up?

Mother	Father	
1	1	job requiring postgraduate education or long period at university (doctor, lawyer, dentist, scientist, professor, ...)
2	2	job requiring university degree (architect, public servant, engineer, teacher, ...)
3	3	parents have high educational expectations (see questions 3,4) and they state that "it is up to the child to decide."
4	4	job requiring high school graduation and some college, university or professional training (draftsman, artist, printer, nurse, ...)
5	5	job requiring high school degree or some high school
6	6	job requiring little education or, only elementary school education or, parents have low educational expectations (see questions 3,4) and they state that "it is up to the child to decide" or "I don't care."

7. Name of job desired:

8. Other answer:

9,10. Do you really think (expect) that x will become a (name the job just mentioned)?

Mother	Father	
1	1	Yes (emphatically)
2	2	I hope so
3	3	No (I don't think so), or parents indicate that it is up to the child to decide, or parents say they don't care
4	4	Other answer

11,12. How long have you had these ideas about the kind of job you would like or want x to have?

Mother	Father	
1	1	since x was born
2	2	before x started school (preschool or kindergarten)
3	3	just after x started school (preschool or kindergarten)
4	4	since last year
5	5	just this year

13. What grades (or marks) do you expect x to receive in his/her schooling experience? (elementary school)

	Mother	Father
All A's	1	1
Mainly A's with some B's	2	2
All B's	3	3
Mainly B's with some C's or ½ B's & ½ C's	4	4
Mainly C's or, as long as x passes, or do the best x can	5	5
Very low expectations, or I don't care	6	6
Other answer:	7	7

14,15. What level of education would you say most of your close friends and relatives reached?

Mother	Father	
1	1	All or most of them have graduated from university or college
2	2	Most have some college, university or training
3	3	Most have completed high school
4	4	Most dropped out of high school
5	5	Most of them completed elementary school
6	6	Most of them left school before the end of elementary school
7	7	Other answer:

16. a. What type of job did/do the parents' father have?

Mother	Father	
1	1	job requiring highest education level (doctor, dentist, professor, ...)
2	2	job requiring university degree (architect, teacher, ...)
3	3	job requiring high school plus some college, university or professional training (nurse, draftsman, ...)
4	4	job requiring high school degree or some high school
5	5	job requiring little education or only elementary school (construction worker, farm laborer, ...)

6. Name the job: (describe if necessary)

b. What jobs do the parents have?

Mother	Father	
1	1	job requiring highest education level
2	2	job requiring university degree
3	3	job requiring high school plus some college, university or professional training
4	4	job requiring high school degree or some high school
5	5	job requiring little education or only elementary school
6	6	no job

7. Name the job: (describe if necessary)

17,18. a. Would the parent like to change her/his job, or is she/he happy to stay in present job?

Mother	Father	
1	1	Yes: would like to change
2	2	No: is content to stay in present job
3	3	No job

b. If yes, ask: Has the parent made any plans which might allow him/her to change jobs?

1	1	Yes
2	2	No

c. If yes, ask: What are the plans?

1	1	already attending courses (school, college, ...)
2	2	taking correspondence courses
3	3	has enrolled in courses to take in the future
4	4	plans to take courses in the future
5	5	no plans
6	6	other answer

19. a. What newspapers do you get regularly?

1. None   2. One to several (List them):

b. How many magazines or journals do you have delivered to your home each month?

		News	General	Trade/Prof	Child
more than six	1				
five or six	2				
three or four	3				
one or two	4				
none	5				

list the magazines:

c. How often do you give x an article from a newspaper or a magazine to read?

Mother	Father	
1	1	nearly every day
2	2	once or twice a week
3	3	occasionally (less than once a week)
4	4	rarely gives an article
5	5	never gives an article

20,21. a. How often is English used orally and/or simultaneously in the home by:

Mother	Father	Child	
1	1	1	all the time
2	2	2	over half the time (most of the time)
3	3	3	half the time (sometimes)
4	4	4	less than half the time (rarely)
5	5	5	never or hardly ever

b. How particular would you say you are about the way (the quality) x uses English orally and/or simultaneously (good vocabulary, correct grammar, ...)

Mother	Father	
1	1	very strict
2	2	quite strict
3	3	not too particular
4	4	don't really care
5	5	unable to help
6	6	Other answer:

22,23. For the interviewer: From your conversation with the parents, rate the quality of the use of English language (oral and/or simultaneous) according to the following criteria:

Quality of English	Fluency of expression		Pronunciation/ sign configuration		Vocabulary	
	Mother	Father	Mother	Father	Mother	Father
excellent	6	6	6	6	6	6
very good	5	5	5	5	5	5
good	4	4	4	4	4	4
fair	3	3	3	3	3	3
poor	2	2	2	2	2	2
very poor	1	1	1	1	1	1

24,25. For ASL-using families:

a. How often is ASL used in the home?

Mother	Father	Child	
1	1	1	all the time
2	2	2	over half the time (most of the time)
3	3	3	half the time (sometimes)
4	4	4	less than half the time (rarely)
5	5	5	never or hardly ever

b. How particular would you say you are about the way (the quality) x uses ASL?

Mother	Father	
1	1	very strict
2	2	quite strict
3	3	not too particular
4	4	don't really care
5	5	unable to help
6	6	Other answer:

26,27. For the interviewer: From your conversation with the parents, rate the quality of the ASL used according to the following criteria:

Quality of ASL	Fluency of expression		Sign configuration		Vocabulary	
	Mother	Father	Mother	Father	Mother	Father
excellent	6	6	6	6	6	6
very good	5	5	5	5	5	5
good	4	4	4	4	4	4
fair	3	3	3	3	3	3
poor	2	2	2	2	2	2
very poor	1	1	1	1	1	1

28,29. For ASL-using families
How important is it to you that ASL should be maintained in the family and that x should use it fluently?

Mother	Father	
1	1	extremely important
2	2	important
3	3	not really important
4	4	not at all important
5	5	don't care

30. a. Does x ever read to you? This means you are attending.

Mother	Father	
1	1	reads primarily orally
2	2	reads primarily simultaneously
3	3	reads primarily manually
4	4	not read to parent

b. If yes, ask: how often does x read to you?

Mother	Father	
1	1	every day
2	2	just about every day
3	3	about 3 or 4 times a week
4	4	probably once or twice a week
5	5	less than once a week
6	6	never
7	7	Other answer:

31. a. Does x seem to enjoy reading on his own (pleasure or school related)?

Mother	Father	
1	1	Yes
2	2	No

b. What does he/she read generally? (e.g., books, magazines, etc)

c. About how many books would he/she read in a month?

Mother	Father	
1	1	none
2	2	less than one a month
3	3	about one or two a month
4	4	3 to 5 a month (about one per week)
5	5	6 to 10 a month (about two per week)
6	6	more than 10

32,33. How often do you help x with her/his English grammar (e.g., tell x how to construct sentences, when to use certain words)?

Mother	Father	
1	1	every day give x some help
2	2	probably nearly every day
3	3	about a couple of times a week
4	4	probably once a week
5	5	less than once a week
6	6	never
7	7	Other answer:

34. a. What language is usually spoken at mealtime?

Mother	Father	
1	1	English
2	2	ASL
3	3	Other (specify)

b. With whom does x generally eat her/his evening meal?

both parents present	1
of the parents, only the mother is present	2
of the parents, only the father is present	3
neither of the parents is generally present	4
generally eats meals alone	5
Other answer:	6

c. Who does most of the talking (orally, simultaneous, or in ASL) at the meal table?

everybody participates (including both parents)	1
the two parents do most of the talking	2
father dominates the conversation	3
mother dominates the conversation	4
no-one is allowed to talk	5
Other answer:	6

35,36. How often do you think you introduce x to a new word and/or sign (indicate which)?

Mother	Father	
1	1	every day we try and tell x a new word and/or sign
2	2	probably, nearly every day
3	3	a couple of times a week
4	4	about once every two weeks
5	5	probably once a month
6	6	never
7	7	Other answer:

37,38. How many books would you generally read in a month?

Mother	Father	
1	1	no books read
2	2	less than one a month
3	3	about one or two a month
4	4	3 to 5 a month (about one a week)
5	5	6 to 10 a month (about 2 a week)
6	6	more than 10

39,40. a. When x was small, before she/he started preschool, did parents ever read to x. If yes, ask how often?

Mother	Father	
1	1	no reading to child
2	2	not very often, less than once a week
3	3	about once a week
4	4	a couple of times a week
5	5	nearly every day (3 to 5 times a week)
6	6	just about every day (6 or 7)

b. In what language did the parents generally read to x?

Mother	Father	
1	1	English
2	2	ASL
3	3	Other language (specify):

41. Does x bring home books to read, either from local library, school library, or friend's place? If yes, ask how many each month?

no books brought home, or I don't know	1
1 or 2 (very rarely brings books home)	2
3 to 5 (about 1 a week)	3
6 to 10 (about 2 a week)	4
more than 10	5

42. a. Do you think that children who are about 10 years old should be restricted from viewing certain types of TV programs or should they decide for themselves what to watch?

Mother	Father	
1	1	should be restricted from certain programs
2	2	decide themselves

b. What about books and comics; should parents restrict 10-11 year-olds from reading certain types of material?

Mother	Father	
1	1	Yes
2	2	No

c. How often would you check to see what x is reading or watching on TV? (Indicate by circling a number each for reading(R) and for watching TV(TV). Also, indicate mother's and father's choice.)

	R	TV
never check	1	1
only occasional (less than ½ the time)	2	2
quite regular (½ the time)	3	3
very regular (over ½ the time)	4	4
check most (all the time)	5	5

43. If the child has older brothers or sisters ask: How often does x get together with any older brothers or sisters to get help with homework or reading?

very often (always)	1	hardly ever	5
often	2	never, or no older brothers or sisters	6
sometimes (½ the time)	3	Other answer (specify):	7
not very often	4		

44. If x has younger brothers or sisters ask: How often does x get together with younger brothers and sisters and play at teaching them?

very often (always)	1	not very often	4
often	2	hardly ever	5
sometimes (½ the time)	3	never, or no younger brothers or sisters	6

45. a. Did any other adults live with you before x started school (i.e., adults who stayed longer than six months)?

no other adults	1	4 or 5	4
just one	2	more than five	5
2 or 3	3		

b. How often did these other adults use English in the home? (orally and/or simultaneously - specify which)

	How often English	How
no adults, or none of them used English	1	1. orally
generally did not use English	2	2. simultaneously
half English, half another language	3	3. primarily manually
mainly English but some other language	4	
all English	5	0. neither/there were no other adults
Other answer (specify):	6	

c. How much time did x spend with these other adults?

no other adults, or no time	1	quite a lot of time	3
not very much time	2	nearly all the time	4

d. How often did these other adults use ASL in the home?

no adults, or none of them used ASL	1
generally did not use ASL	2
half ASL, half English	3
mainly ASL but some other language	4
all ASL	5
Other answer (specify):	6

46. a. How many other adults live with you now?

no other adults	1	4 or 5	4
just one adult	2	more than 5	5
2 or 3	3		

b. How often do these other adults use English in the home? (orally and/or simultaneously - specify which)

	How often English	How
no adults, or do not use English	1	1. orally
generally do not use English	2	2. simultaneously
half English, half another language	3	3. primarily manually
mainly English but some other language	4	
all English	5	0. neither/there were no other adults
Other answer (specify):	6	

c. How much time does x spend with these other adults?

no other adults, or no time	1	quite a lot of time	3
not very much time	2	nearly all the time	4

d. How often do these other adults use ASL in the home?

no adults, or none of them use ASL	1
generally do not use ASL	2
half ASL, half another language	3
mainly ASL but some other language	4
all ASL	5
Other answer (specify):	6

47,48. a. What recreational activities (if any) do the parents and x engage in together (at home)?

Mother	Father	
1	1	a great variety of activities (some every week)
2	2	quite a few activities (some nearly every week)
3	3	a moderate variety of activities (1-2 a month)
4	4	very few or no activities

b. Name one or two examples:

49,50. a. Do you expect x to spend a regular amount of time each day at her/his studies or homework outside of school time?

Mother	Father	
1	1	Yes
2	2	No

b. If yes, ask: How much time on the average do you expect x to spend on her/his school related work each day?

Mother	Father	
1	1	more than 2 hours each weekday
2	2	between 1 and 2 hours each day
3	3	about 1 hour each day
4	4	less than 30 minutes each day or, as much as the child wants or needs to do
5	5	no time expected

c. Does he/she have a special study place or a place in the home that he/she regularly uses to do his/her schoolwork?

Mother	Father	
1	1	Yes
2	2	No

d. Where:

51. a. If the parents expect x to pursue education after leaving school (see question 3,4), ask: Have you given any consideration for making financial preparations to send x to college or university?

1 Yes
2 No, not yet
3 No need to make plans: wealthy family, "free" education
4 Will wait until x finishes high school
5 Other answer:

b. If yes, ask: What are the plans?

1 Evidence of financial preparation already in existence (savings, policies, insurance)
2 Enquiries have been made but no action has been taken
3 Consideration has been given, but no enquiries have been made, nor action taken
4 Other answer:

52,53. How often do you praise x or congratulate x for her/his schoolwork?

Mother	Father	
1	1	every day
2	2	nearly every day (a few times a week)
3	3	two or three times a week
4	4	once, or less than once a week
5	5	never praise

6 Name the praise:

54. A. In what hobbies or activities is x interested at the moment? (Circle 1 or 2)

1. Has hobbies
   List the hobbies and activities:

2. Not interested in hobbies

B. Who seemed to get x interested in these hobbies?

1 both parents initiated the interest
2 mother initiated the interest
3 father initiated the interest
4 the child became interested without any parental involvement
5 someone outside the family initiated the interest (including the school)
6 If not parent or child, specify who:

55,56. Would you know what topic x is studying (or has just finished studying) in arithmetic or English?

Mother	Father	
1	1	knows specific topics (e.g., division of fractions or adverbial clauses)
2	2	indicates uncertainty about the specific topic (e.g., I think that it is division of fractions)
3	3	knows general topic (e.g., fractions)
4	4	indicates uncertainty about the general topic (e.g., I think it is fractions)
5	5	has no idea of present topics but mentions some earlier topics that were studied
6	6	has no idea of the topics that have been studied
7	7	Other answer:

57,58. What grades or marks did x receive in arithmetic and English in her/ his last test?

Mother	Father	
1	1	definite knowledge of grades in both subjects (e.g., B in arithmetic and C in English)
2	2	definite knowledge of marks in one of the subjects
3	3	indicates uncertainty about the grades in both of the subjects (e.g., I think a B in arithmetic and probably a C in English)
4	4	indicates uncertainty about one subject, no knowledge of the other
5	5	mentions grades from previous tests but unable to indicate the results from the last test
6	6	no knowledge of child's grades in either subject
7	7	Other answer:

59. a. Do you have an encyclopedia (or almanac, or set of fact books) in the home?

1	Yes
2	No

b. If yes, ask: What kind are they? (Fill in the table)
c. How long have you had them? (Fill in the table)

	Time had them			
Type of encyclopedia or reference book	less than one year	1 to 2 years	3 to 4 years	over 5 years
1				
2				
3				
4				
5				

d. How often do the mother and x get together to look at and discuss them?

about once (or more) a week	1
once or twice a month	2
never, or not very often	3
Other answer:	4

e. How often do the father and x get together to look at and discuss them?

about once (or more) a week	1
once or twice a month	2
never, or not very often	3
Other answer:	4

60,61. What educational activities have the parents and x engaged in together during the past six months (what visits have you gone on together, what places have you visited together)? List the activities:

Mother	Father	
1	1	engaged in 5 or more educational activities (i.e., activities such as visits to concerts, museums, zoos, historical places)
2	2	engaged in 3-4 activities of high educational value
3	3	engaged in 1 or 2 activities of educational value
4	4	engaged in 4 or more recreational activities (e.g., visits to sporting events)
5	5	engaged in 1 to 3 recreational activities together
6	6	no outside activities
7	7	Other answer:

62. a. Out of the last four weekends, on how many have you taken x on an outing? (Explain "outing").

	Mother	Father
on each of the 4 weekends	1	1
on 3 of the weekends	2	2
2	3	3
1	4	4
none of them	5	5

b. Out of the next four weekends, how many have you planned to take x on an outing?

	Mother	Father
the 4 of them	1	1
probably 3 of them	2	2
2	3	3
1	4	4
none of them	5	5

63. Have the parents taken any courses (outside the home) over the past two or three years? (e.g., language courses, sculpturing)

Mother	Father	
1	1	Yes
2	2	No

If yes, ask: What are they?

Mother	Father	
1	1	academic subjects: List them
2	2	sculpturing, music, art
3	3	household courses: cookery, sewing
4	4	sports coaching, exercises
5	5	Other courses:

64. a. Does x take any lessons or courses outside of school? (e.g., music, art, academic subjects, sports coaching)

1	Yes
2	No

b. If yes, ask: What does x take?

academic subjects: List them	1
art, classical music, sculpturing	2
popular music (guitar), singing	3
sports coaching, swimming lessons	4
Others:	5

c. Whose idea was it that x should take these lessons?

both parents initiated the idea	1
mother's idea	2
father's idea	3
child's own idea without parental involvement	4
someone outside the family initiated the idea	5
If not parents or child, specify who:	6

65. a. What does x generally do most often between the time she/he comes home from school and the evening meal?

does homework, reads, studies	1
takes courses: music, art, sculpturing, etc.	2
gets involved in hobby: Name the hobby	3
plays games outside of the house	4
watches TV or listens to the radio/stereo	5
Other activities (List them):	6

b. After your evening meal what does x generally do?

homework and then reads (or just reads or just homework)	1
homework and then gets involved with hobby (or, just does hobby	2
reads (or homework) and watches some TV	3
watches TV and/or listens to the radio/stereo	4
Other activities (list them):	5

66. a. About how many hours does x watch TV on Saturday and Sunday?

doesn't watch TV on weekends	1
less than 1 hour each day	2
between 1 and 3 hours a day	3
between 4 and 5 hours a day	4
more than 5 hours a day	5

b. How about weekdays? How long does x watch it each day?

doesn't watch it	1
less than 1 hour each day	2
between 1 and 3 hours a day	3
between 4 and 5 hours a day	4
more than 5 hours a day	5

c. What TV programs does x generally watch?

most are educational (current affairs programs, science documentaries)	1
mixture of educational and recreational	2
all recreational	3
don't know	4

List the regular programs (favorite three or more):

d. How often do parents discuss a TV program with x?

very regularly	1
occasionally	2
have only ever discussed one or two programs	3
never have had any follow-up discussions	4
Other answer:	5

67. At what age did you or would you expect x to be allowed to do the following by herself/himself?

a. Earn own spending money 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

b. Be able to undress and go to bed by her/himself 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

c. To know her/his way around the neighborhood so she/he can play where she/he wants to without getting lost 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

d. To make friends and visit their homes 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

e. To stay alone at home at night 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

f. To make decisions like choosing clothes or deciding how to spend money 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

g. To act as a babysitter at someone else's home 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

h. To sleep at a friend's home overnight 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

i. Go to the movies alone 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

j. Go on an overnight trip organized by the school 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

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68. Do the parents ever discuss x's progress at school with each other? If yes, ask how often?

never discuss progress	1
not very often, less than once a week	2
a couple of times a week	3
nearly every day (3 or 4 times a week)	4
every school day	5

69,70. If you see that x is having real difficulty with something she/he is doing (like building a model, fixing a toy, doing homework) what would you generally do?

Read alternatives

Mother	Father	
1	1	generally do it for x
2	2	sit down with x and help
3	3	offer to help
4	4	wait for x to ask for help, and then show x how to do it
5	5	wait for x to ask for help, but insist that x continue to do it by herself/himself

71,72. What educational level did the parents reach?

Mother	Father	
7	7	higher degree level (Ph.D.; M.D.; Law Degree)
6	6	university/college graduate
5	5	high school plus some college/university or training
4	4	finished high school
3	3	some high school
2	2	finished elementary school
1	1	less than elementary school completed

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73. How do you react to the following statements [agree strongly (1), agree (2), don't know (3), disagree (4), disagree strongly (5)] Read the response choices.

		agree strongly	agree	don't know	disagree	disagree strongly
a	Even when a boy gets married his main loyalty still belongs to his parents	1	2	3	4	5
b	When a girl gets married her main loyalty belongs to her parents	1	2	3	4	5
c	When the time comes for a son to take a job, he should try and stay near his parents, even if it means giving up a good job opportunity	1	2	3	4	5
d	When the time comes for a daughter to take a job, she should try and stay near her parents, even if it means giving up a good job opportunity	1	2	3	4	5
e	Nothing in life is worth the sacrifice of moving away from one's parents	1	2	3	4	5
f	If a family cannot afford to provide education for all their children after high school, then any boys in the family should get preference	1	2	3	4	5
g	If a family cannot afford to provide education for all their children after high school, then any girls in the family should get preference	1	2	3	4	5

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74,75. a. Do you believe you have adapted to (adjusted to) x's deafness? (Leave open ended--let parent respond freely--interviewer then interprets response as fitting into one of the stems. Interviewer may prompt with "idea" of stem but in own language.)

Mother	Father	
1	1	Very high level of adaptation; deafness is considered a person characteristic of child integral to his/her nature and being; parents give no indication that they focus on the handicapping nature of the hearing loss
2	2	High level of adaptation; parents give very moderate indication that they focus on the handicapping nature of the hearing loss
3	3	Fairly high - moderate adaptation; parents give more but still moderate indication that they focus on the handicapping nature of the hearing loss.
4	4	Moderate - low adaptation; parents give fairly high indication that they focus on the handicapping nature of the hearing loss. hearing status
5	5	Almost no adaptation to deafness as a person characteristic of x; parents give very high indication that they focus on the handicapping nature of the hearing loss consistently.

Notes:

b. How long do you believe you have been adapted to x's deafness? Probe for accuracy.

Mother	Father	
1	1	since x's deafness was diagnosed
2	2	before x started school (preschool or kindergarten)
3	3	soon after x started school (preschool or kindergarten)
4	4	since last year
5	5	just last year

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76,77. How did you come to adapt to or to accommodate x's deafness? (history) (Again, allow parents to respond freely first before giving them prompt).

Prompts: Did you talk with professionals?
Did you talk with other hearing parents of deaf children?
Were there difficult "stages" (explain) in your adjustment?
Did you meet deaf adults?
Did you use information about deafness?
Did you read a lot about the handicap?

Mother	Father	
1	1	Very highly rationally-based (realistic); emotions have been dealt with; adaptive behavior arrived at by parents working through an ongoing series of difficult "stages," crises periods, or critical times toward adjustment; a result of a combination of personal thought and effort, perhaps with professional and peer consulting, and accumulating knowledge about deafness
2	2	Highly rationally-based; emotions dealt with but slightly less effectively; parents have attempted to work through difficult "stages" but have been less successful; less concern with dealing with personal thinking and interaction with peers and professionals and with gaining knowledge re: deafness
3	3	Fairly highly rationally-based; still less effective with dealing with emotions; still less success at meeting crises although parents tried; moderate concern with personal thought and interaction with peers and professionals or with gaining knowledge about deafness
4	4	Moderately-low rationality; emotions have been dealt with very ineffectively; little attempt to work through difficult periods; little concern with personal thought and interaction with peers and professionals or with gaining knowledge about deafness
5	5	Almost no rationally-based adaptation; emotions have not been dealt with; very little or no attempt to work through pain of crisis toward adaptation; very little or no concern with personal thought and effort and interaction with peers and professionals or with gaining knowledge about deafness

Notes:

78,79. What is x's hearing loss as measured in decibels, what level or classification (moderate, severe, profound) is his/her loss, what does x appear to hear and what doesn't he/she appear to hear?

Mother	Father	
1	1	knows exact dB loss, level/classification and what x hears and doesn't hear
2	2	knows quite accurately the dB, level/classification and what child hears and doesn't hear
3	3	knows fairly well/roughly the dB, level/classification and what x hears and doesn't hear
4	4	knows almost nothing about dB, level/classification and what x hears or doesn't hear
5	5	has no knowledge about the dB, level/classification and what x hears or doesn't hear (may include here: does not care)

80,81. Would you know the brand name and type of x's hearing aid(s)? How does the aid(s) appear to affect x's hearing? Is it an appropriate aid/are you satisfied with it for x?

Mother	Father	
1	1	knows exact brand and type, how aid affects x's hearing and if its appropriate and if satisfied
2	2	knows quite accurately the brand and type, how aid affects hearing and if its appropriate and if satisfied
3	3	knows fairly well/roughly the brand and type, how aid affects x's hearing and if its appropriate and if satisfied
4	4	knows almost nothing about the brand and type, how aid affects x's hearing and if its appropriate and if satisfied
5	5	has no knowledge about brand and type, how aid affects hearing and if its appropriate and if satisfied

82,83. Would you know what skill or area of development x is working on (or has just finished) in speech or auditory training (or a sign language communication course if x is not enrolled in speech and/or auditory training. Indicate which).

Mother	Father	
1	1	knows specific skill or area (e.g., development of particular vowel sound - gives names of vowel)
2	2	indicates uncertainty about the specific topic (e.g., I think its development of these vowels.)
3	3	knows general topic (e.g., working on vowels)
4	4	indicates uncertainty about the general topic (e.g., I think its vowels.)
5	5	has no idea of current or just finished topics but mentions some earlier topics
6	6	has no idea of any of the topics that have been studied
7	7	Other answer:

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84, 85. What level of performance was indicated in x's most recent speech or auditory training (or communication course) progress report?

Mother	Father	
1	1	Definite and specific knowledge of performance
2	2	Indicates uncertainty about the progress
3	3	Mentions performance information from previous reports but unable to indicate the the most recent
4	4	No knowledge of child's performance
5	5	Other answer:

86. Do parents discuss with each other x's progress in speech and auditory training (or sign communication course)? If yes, ask how often?

1	never discuss progress
2	not very often, less than once a week
3	a couple of times a week
4	nearly every day (3 or 4 times a week)
5	every school day

87,88. Have parents met with x's speech/auditory training (or sign communication) teacher (or whoever is responsible for these areas) to discuss x's progress in speech and auditory training (or sign communication)? If yes, ask how often, who initiated?

Mother	Father	
1	1	never met with teacher for this purpose
2	2	less than once a semester, teacher initiated
3	3	a couple of times a semester, teacher initiated
4	4	several times a semester, parent initiated most of the time
5	5	often, every 2-3 weeks, parent initiated

89,90. If child uses manual communication have the parents taken any manual communication (sign language) courses? (e.g., SEE 1, SEE 2, ASL, fingerspelling)

Mother	Father	
1	1	Yes
2	2	No
3	3	When (how old was x?) _______ months or years

4. What courses (mother):

5. What courses (father):

6. When did x start to sign? _______
x's age

91, 92. What other (not a course) activities related to learning to or improving their sign, have the parents engaged in during the past six-eight months? List the activities:

Mother	Father	
1	1	engaged in 5 or more educational-type activities (e.g., attended lectures, workshops; visited/ observed Total Communication school programs; read books, etc.)
2	2	engaged in 3-4 activities of high educational value
3	3	engaged in 1-2 activities of educational value
4	4	engaged in 4 or more recreational activities (e.g., picnics of class)
5	5	engaged in 1-3 recreational activities
6	6	no other activities
7	7	Other answer:

93. Do the parents ever discuss with each other x's general communication (receptive and expressive language) progress (either oral or manual)? If yes, ask how often?

1 never discuss progress
2 not very often, less than once a week
3 a couple of times a week
4 nearly every day (3-4 times a week)
5 every school day

94,95. Have parents met with x's teacher (or other appropriate professional) to discuss x's general communication progress? If yes, ask how often, who initiated.

Mother	Father	
1	1	never met with teacher for this purpose
2	2	less than once a semester, teacher initiated
3	3	a couple of times a semester, teacher initiated
4	4	several times a semester, parent initiated most of the time
5	5	often, every 2-3 weeks, parent initiated

96,97. Would you know what x's general communication (receptive and expressive) abilities are?

Mother	Father	
1	1	knows specifically what kind of information (under what conditions) x understands (and not), what kind of information he can and cannot express and how
2	2	knows quite specifically about x's specific communication abilities
3	3	knows fairly well/roughly about x's communication abilities generally
4	4	knows very little about x's communication abilities
5	5	knows almost nothing about x's communication abilities
6	6	has no idea about x's communication abilities

98,99. a. Do the parents participate in functions, organizations or any activities in the deaf community?

Mother	Father	
1	1	Yes
2	2	No

3. List the activities:

b. How often and when started the participation?

Mother	Father	
1	1	several (3-4) times a month
2	2	once a month
3	3	several (5-6) times a year
4	4	once or twice a year
5	5	seldom, almost never
6	6	never do

c.

Mother	Father	
1	1	since x's deafness was diagnosed
2	2	before x started school (preschool or kindergarten)
3	3	soon after x started school (preschool or kindergarten)
4	4	since last year
5	5	just this year
6	6	never do

100. Do the parents ever discuss the deaf community/culture with each other? If yes, ask how often?

1 never discuss
2 not very often, less than once a week
3 a couple of times a week
4 3-4 times a week
5 nearly every day

101,102. Have parents met with x's teacher (or other appropriate school persons) to discuss the deaf community/culture? _If yes_, ask who initiated, how often?

Mother	Father	
1	1	never met with teacher for this purpose
2	2	less than once a semester, teacher initiated
3	3	a couple of times a semester, teacher initiated
4	4	several times a semester, parent initiated most of the time
5	5	often, every 2-3 weeks, parent initiated

103. How do you react to the following statements (complete for mother and father) [agree strongly (1), agree (2), don't know (3), disagree (4), disagree strongly (5)]. _Read the response choices._

	agree strongly	agree	don't know	disagree	disagree strongly
a) Deaf children have a greater need for more constant supervision in order to protect them from accident (than do hearing children)	1	2	3	4	5
b) Parents have to make greater concessions (e.g., discipline, bedtime) and modifications in the "rules" more often for deaf children than for hearing children	1	2	3	4	5
c) Parents of deaf children in all likelihood find it necessary to change their discipline techniques for the child because he is deaf	1	2	3	4	5

d) _Ask_: What discipline techniques are used?
List:

e) Parents should offer an explanation or rationale for the discipline	1	2	3	4	5

f. Ask: How do you explain to your child the reason for rules, limits, or discipline? (probe)

104. What is the age of the parents?

1. Mother ____
2. Father ____

Last questions

105. Is there anything else you wish to tell me about x and your family relative to what we have been talking about today or that you would like to add?

Mother	Father	
1	1	Yes
2	2	No

Notes:

106. Would you like to receive a summary of the results of this study when it is completed?

1. Yes

2. No

THANK YOU VERY MUCH FOR YOUR PARTICIPATION IN THE STUDY.

Date of Interview: Name of Child:
Name of Interviewer:

Family Environment Schedule: Part A

Rating Scales

1. Use the following scale to rate the expected and present occupations of all the children in question 46.

    1 job requiring postgraduate education or long period at university (doctor, lawyer, dentist, scientist, professor, ...)
    2 job requiring university degree (architect, public servant, engineer, teacher, ...)
    3 parents have high educational expectations (3,4B) and they state that "it is up to the child to decide."
    4 job requiring high school graduation and some college, university or professional training (draftsman, artist, nurse, ...)
    5 job requiring high school degree or some high school
    6 job requiring little education or only elementary school education (3,4B) or, parents have low educational expectations and they state that "it is up to the child to decide" or "I don't care."

Family Environment Schedule: Part B

Rating Scales

1. Rating Scale for questions 5 and 6 (complete for mother and father)

	Time Period				
Educational Expectations from questions 3 and 4	Since x was born	Before x started school	Just after x started school	Since last year	Just this year
postgraduate education	6	5	4	3	2
university/college graduate	5	4	3	2	1
high school and some college/ university or training	4	3	2	1	1
finish high school	2	2	1	1	1
less than high school completion	1	1	1	1	1

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2. Rating scale for question 9 and 10 (complete for mother and father).

Job Type Expectations (from questions 7 and 8)	Yes (emphatically)	I hope so	No (I don't think so)
postgraduate education	6	4	2
college/university degree	5	3	2
high school and some college or training	4	2	1
high school completion or some	3	2	1
less than high school	2	1	1
no expectations	1	1	1

3. Rating scale for questions 11 and 12 (complete for mother and father)

	Time Period				
Job Type Expectations (from questions 7 and 8)	Since x was born	Before x started school	Just after x started school	Since last year	Just this year
job requiring postgraduate education	6	5	4	3	2
college/university degree	5	4	3	2	1
high school graduation and some college or training	4	3	2	1	1
high school graduation or some	3	2	1	1	1
less than high school graduation	1	1	1	1	1

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4. Rating scale for question 16 (parents' occupation level in relation to their father's).

Parents' occupation level (16b) (complete for child's mother and father)

Father's occupation level (16a)	little education (no h.s.)	high school some or degree	high school plus some training	college or university	highest level
highest level	1	1	1	3	5
college/ univesity	1	1	2	4	5
high school plus some college or training	1	2	3	5	5
high school, some or degree	1	3	4	5	6
little education (no h.s.)	2	3	4	5	6

5. Rating scale for question 17,18 (complete for both mother and father)

Occupation level (see question 16b)	not content, is taking courses	not content is planning to take courses	not content, no plans	content with job
highest level	6	6	5	5
college/ university	6	5	4	4
high school plus some college or training	6	5	4	3
high school	5	4	3	2
little education, or no job	4	3	2	1

6. Rating scale for question 19

Rate given to x to read	Number of magazines and newspapers received			
	Many, more than 5	3-4	1-2	less than one a week
nearly every day	6	5	4	3
once or twice a week	5	4	3	2
occasionally	3	2	1	1
rarely	2	1	1	1
never	1	1	1	1

7. Rating scale for questions 20 and 21 (complete for both parents)

Frequency of English, oral and/or simultaneous by parent	Concern for quality of English by parents			
	very strict	quite strict	not too particular	don't really care, or unable to help
All the time	6	5	4	3
Over half the time	5	4	3	2
Half the time	4	3	2	1
Less than half the time	3	2	1	1
Never or hardly ever	2	1	1	1

8. Rating scale for questions 22, 23. Complete for both mother and father.

Parent's English quality scores (22,23)	Frequency of English (20,21)				
	all the time	over half the time	half the time	less than half	never
16-18	6	5	4	3	1
13-15	5	4	3	2	1
10-12	4	3	2	1	1
7-9	3	2	1	1	1
3-6	1	1	1	1	1

9. Rating scale for questions 24 and 25 (complete for both parents)

	Concern for quality of ASL by parents			
Frequency of ASL used by parent	very strict	quite strict	not too particular	don't really care, or unable to help
All the time	6	5	4	3
Over half the time	5	4	3	2
Half the time	4	3	2	1
Less than half the time	3	2	1	1
Never or hardly ever	2	1	1	1

10. Rating scale for questions 26, 27. Complete for both mother and father.

	Frequency of ASL (24,25)				
Parents' ASL Quality Scores (26,27)	all the time	over half the time	half the time	less than half	never
16-18	6	5	4	3	1
13-15	5	4	3	2	1
10-12	4	3	2	1	1
7-9	3	2	1	1	1
3-6	1	1	1	1	1

11. Rating scale for question 34 (substitute ASL for English if choice in 34a)

1. English (only at mealtime-both parents present-concern for good language) (see question 20b, 21b or 24b, 25b). Everyone participates
2. English (only). One parent present. Concern for good English. Everyone participates
3. English (only) - parents present. Concern for good English. Parents dominate
4. Both parents present. No or little concern for good English. Everyone participates
5. One parent is present. No or little concern for good English.
6. Neither of the parents is present.

12. Rating scale for questions 47, 48 (for both parents)

Activities with parent	English score of parent (see questions 22,23)				
	16-18	13-15	10-12	7-9	3-6
great variety	6	5	4	3	2
quite a few	5	4	3	2	1
moderate variety	4	3	2	1	1
very few or none	2	2	1	1	1

13. Rating scale for questions 47, 48 for ASL-using families (complete for mother and father)

Activities with parent	ASL score of parent (26,27)				
	16-18	13-15	10-12	7-9	3-6
great variety	6	5	4	3	2
quite a few	5	4	3	2	1
moderate variety	4	3	2	1	1
very few or none	2	2	1	1	1

14. Rating scale for question 51

financial preparation is in existence	1
enquiries have been made, but no action	2
consideration given but no enquiries	3
consideration not yet given	4
will wait until x finishes high school	5
no plans for further education	6

15. Rating scale for questions 52,53 (complete for both mother and father)

Frequency of praise by parent	Job expectations (see questions 7,8)		
	highest	moderate	low
every day or nearly every day	6	5	3
2 or 3 times a week	5	4	2
once or less than once a week	3	2	1
never praise	1	1	1

16. Rating scale for questions 52,53 (complete for both mother and father)

Frequency of praise by parent	Education expectations (see questions 3,4)		
	highest	moderate	low
every day or nearly every day	6	5	3
2 or 3 times a week	5	4	2
once or less than once a week	3	2	1
never praise	1	1	1

17. Rating scale for questions 52,53 (for both parents)

Frequency of praise by parents	Expectations of grades or marks (see question 13)		
	highest	moderate	low
every day or nearly every day	6	5	3
2 or 3 times a week	5	4	2
once or less than once a week	3	2	1
never praise	1	1	1

18. Rating scale for question 54.

Initiation of interest	Number of hobbies		
	3 or more	2	1
Both parents	6	5	4
One parent	5	4	3
Not by parents	2	1	1

19. Rating scale for question 59.

Much discussion of the books (both parents or one parent and other members of the family	1
Much discussion of the books with one person in the family	2
Discussions about once or twice a month with many members of the family	3
Discussions about once or twice a month with one member of the family	4
Books present but very rarely are there any discussions	5
No books present	6

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20. Rating scale for question 62.

a. 1 weekend: 1 2 weekends: 2 3 or more weekends: 3

b. 1 weekend: 1 2 weekends: 2 3 or more weekends: 3

21. Rating scale for question 63.

1	1	parent taken 3 or more educational courses
2	2	2 educational courses
3	3	1 educational course
4	4	2 or more recreational courses
5	5	1 recreational course
6	6	no courses taken by parent

22. Rating scale for question 64.

	Number of courses taken			
	Educational courses		Recreational courses	
Initiation of interest in courses	2 or more	1	2 or more	1
both parents	6	5	4	3
one parent	5	4	3	2
not by parents	3	2	1	1

23. Rating scale for question 65.

afternoon		evening	
completely recreational	1	completely recreational	1
educational and recreational	2	educational and recreational	2
courses and hobbies	3	courses and hobbies	3

24. Rating scale for question 66.

mainly educational programs, much discussion	1
mainly educational, moderate discussion	2
mixture of educational and recreational, much discussion	3
mixture of educational and recreational, moderate discussion	4
mainly recreational, much discussion	5
mainly recreational, moderate discussion	6

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25. Rating scale for questions 74,75 (complete for mother and father).

	Time period				
Current level of adaptation	Since x's deafness was diagnosed	Before x started school	Soon after x started school	Since last year	Just this year
very high	6	5	4	3	2
high	5	4	3	2	1
fairly high	4	3	2	1	1
moderate-low	3	2	1	1	1
almost no	1	1	1	1	1

26. Rating scale for questions 76,77 (complete for mother and father).

	Time period (from 74,75b)				
History	Since x's deafness was diagnosed	Before x started school	Soon after x started school	Since last year	Just this year
very high	6	5	4	3	2
high	5	4	3	2	1
fairly high	4	3	2	1	1
moderate-low	3	2	1	1	1
almost no	1	1	1	1	1

27. Rating scale for question 89, 90. When did parents learn to sign relative to when x started to sign, i.e., relative to when the need became apparent

Mother	Father	
1	1	immediately when parent recognized the need (e.g., when x started to sign)
2	2	fairly soon after x started to sign
3	3	quite a while after x started to sign
4	4	a long time after x started to sign
5	5	just started/enrolled in a class
6	6	no sign language courses taken

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28. Rating scale for questions 98, 99. Complete for both parents.

	Time Period (from 98,99c)				
Frequency of Participation (98,99b)	Since x's deafness was diagnosed	Before x started school	Soon after x started school	Since last year	Just this year
Several times a month	6	5	4	3	2
Once a month	5	4	3	2	1
Several times a year	4	3	2	1	1
Once/twice a year	3	2	1	1	1
Seldom	1	1	1	1	1

APPENDIX B

SOCIOECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF FAMILIES WITH HEARING IMPAIRED CHILDREN COMPARED WITH THOSE OF THE NATION'S FAMILIES

SOCIOECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF FAMILIES WITH HEARING IMPAIRED CHILDREN COMPARED WITH THOSE OF THE NATION'S FAMILIES

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Purpose

Two major concerns in doing family research with a special population, such as families with hearing impaired children, is ascertaining a) that the results from the study sample are generalizable to other hearing impaired children with similar characteristics, and b) that the source of the influence on the variable(s) under study is identified and explained to a known degree by the researcher and not attributable to some unknown systematic influence.

This paper reports on analyses of selected population characteristics of 124 families with hearing impaired children who were participants in a large scale study regarding their home environments. The purpose of this paper is to respond to the concerns listed above by aligning demographic and socioeconomic characteristics of a regional sample of families with hearing impaired children with those of a sample of the nation's families with hearing impaired school children as well as with U.S. general population characteristics.

Perspective

The degree to which a sample in any study is a model of the population generally is a basic consideration in doing research and has a profound effect on what applications of the findings the field is able to make. A representative sample is usually achieved by drawing randomly from the population using a sampling design.

The constraint in drawing a random sample of families with deaf children is identifying the universe of those families. No registry or enrollment figures exist for this population. Researchers in the area of deafness continually meet the problem of representativeness of their sample. This paper can be viewed as a case study of a methodology that deals with this problem. It is imperative to answer the questions: is the study sample like families with hearing impaired children in the nation--or might there be some regional quirk having an influence on the findings and if they are the same then what systematic differences exist between my and the nation's families?

Method and Data Source

Approximately 124 families, including deaf and hearing parents, with 9-13 year-old severely to profoundly deaf children from the northeastern (CT, MA, NY, PA, RI) and southern (DC, MD, VA) regions of the United States were interviewed in their homes as participants in a larger study of family learning environments of deaf children. Age at onset of the child's hearing loss was no later than 18 months. The children had no known additional handicapping conditions. Information on socioeconomic and demographic characteristics was gathered during the interview.

Comparisons of descriptive data of families with non-handicapped children were made with Bureau of the Census information contained in Current Population Reports. Comparisons with families with hearing impaired children in the overall United States were made with the most current information published by the Office of Demographic Studies at Gallaudet College.

Specifically, the Gallaudet College Office of Demographic Studies (ODS) data reported by Rawlings in Rawlings and Jensema (1977) will be used for comparative purposes. This ODS study reported data on a national sample of nearly 800 families with one or more deaf child enrolled in a special educational program in 1974.

Parental Hearing Status

Karchmer et al (1981) reported that 2.6% of the deaf students in U.S. school programs during the 1978-79 school year had two deaf parents. The ODS data indicated that 91% of the approximately 800 children were reported to have both parents with normal hearing; 3% had two deaf parents and the remaining had only one parent with a hearing impairment. It appears that both Karchmer and ODS corroborate the Schein and Delk (1974) deaf population statistics. However, the parental hearing status of the parents in the family environment study sample would appear to have formed a significantly different pattern than the three national comparison groups. It is suggested here that since the Washington, D.C. metropolitan area has a large adult deaf community, it is more likely that the deaf school population in the area will have deaf parents than would the school population in an area sparsely populated by deaf adults. Table 1 displays the figures for parental hearing status.

Parents' Educational Attainment

Overall, fathers from the ODS sample tended to be the least well educated compared to either the U.S. general population male heads of household or the family environment fathers. A higher percentage of these fathers had completed only elementary school or less while fewer had attended one or more years of college. See Table 2 for detailed figures. Mothers from the ODS study, on the otherhand, compared favorably with female heads of households where no male is present from the general population.

The family environment sample distribution of fathers and mothers educational attainment was significantly unlike either other groups' distribution. This set of parents had much higher representation in the college educated category with extremely few mothers or fathers completing only 0-8 years of elementary school. This increase in college educated parents is to be expected in 1982-83. Since 1974 college enrollment of persons 25 and over has increased by about 26% due to an increase in eligible population and in enrollment rate. Women 25 and over have experienced particularly large increases in college enrollment. The number of women 25 to 34 years old enrolled in college rose by 59% from 1974 to 1979, while the number of men enrolled was about the same in 1974 and 1979 (U.S. Bureau of the Census, 1981). Given these comparison data, it would appear that the educational attainment of the family environment sample of women whose mean age was 37 coincides with that of the general population in 1979 and the ODS 1974 sample.

It should be noted that the U.S. comparison group was comprised of data representing educational levels reached by male and female heads of families. Neither of the studies with parents of deaf children were broken down by female or male head of household. Also, the percentages reported for the general population reflect families where there were one or more children enrolled in preschool through college level education. Finally, the college-educated category for the family study sample included college plus any professional training so this might contribute to the seemingly higher percentages for this group.

Parental Occupation

The family environment study sought information on the employment status of parents. While 65% of the mothers of the 9-13 year old study children reported they had occupations other than housewife, in 1980 in the general population 57% of mothers with children under 18 years of age were in the labor market. In the ODS 1977 study, only 36% of the mothers of deaf children in special education programs were in the labor force. The higher percentage of working mothers in the family environment study may be attributed to the higher economic demands of the geographic/metropolitan areas in which the study families reside and the increased need since 1977 for additional family income.

If the higher percentage of working mothers in this study sample is an indication of a trend generally in families with hearing impaired children, then a need exists for school programs to consider this in educational planning. Certainly if a mother works outside the home she has less time available to spend with and on her deaf child. This has implications for family involvement in the school and, of course, the need for day care and after-school care programing for the majority of deaf children.

Table 3 provides a breakdown of occupational characteristics of the parents of the deaf children in the family environment study, of the ODS study and also of the most recent general U.S. distribution of male and female heads of households. The ODS and general U.S. distributions are classified by Census Bureau Categories. The family environment occupational breakdowns were classified following a different but comparable set of occupation categories. The numbers in the table in the Family Environment column, therefore, represent a "best fit" for purposes of comparison among categories. Although the distribution of fathers from the ODS study tended to have a similar distribution of occupation as the male heads of households in the general population (although more highly represented in the "service" category), the distribution of fathers in the family environment study shows slightly more fathers in the "professional" category, many more fathers in the "clerical" or middle category and a drop in numbers in the "service" category. Thus, the family environment fathers compared to the other groups, tend to be employed in higher level occupations. The distribution of occupation of family environment mothers is similar to the other two groups across Categories II and III; however, these mothers were employed more frequently in Category I than the other two groups of women.

When Table 2, Educational Attainment, is examined along with Table 3, it might be expected that these mothers should enter the labor market at a higher level since 58% have some college. However, Occupation Categories II and III each require some college or training and a total of 62% of the family environment mothers have jobs in these categories. The relatively higher 39% in Category I may be related to more mothers returning or entering the labor force at a lower job level than they are suited for in order to contribute to family income in response to the family's need rather than the job being the mother's career goal.

The comparison of the family environment parents' occupation patterns with the general population and a national sample of parents of deaf children points out the need to consider the seemingly subtle, but unique, characteristics of a study sample. Whether this uniqueness is explained by current population trends, geographic peculiarities or a "deafness" factor is a question to which the researcher needs to respond.

Family Size: Number of Children

In the general population, the mean number of children in families with children under 18 years of age is 2.73 children (U.S. Bureau of the Census, 1982). Comparable families with hearing impaired children from the ODS data tended to be larger, with a mean of 3.2 children. However, the mean family size for the family environment sample was also 2.7 although it did consider all age children.

Table 4 displays the total number of children born to mothers of hearing impaired children in the ODS and the family environment sample. Data for women between the ages of 18-34 in the general U.S. population are also tabulated. As can be seen, a greater percentage of women who have had a hearing impaired child tend to have more births than do women in the general population.

It should be noted that the differences in years in the ODS and other groups is a factor in interpreting these percentages.

Conclusion

This report summarizes demographic and socioeconomic data believed to be important for classifying the family environment study sample into relationships with populations. This enabled the researcher to better interpret the findings of the study in which these families participated.

How well the educational community responds to the needs of families with deaf children depends to a large part on the level of its understanding and the degree of sensitivity to the family as a participant in the larger society as well as a family unit with unique characteristics. The discussion of demographic and socioeconomic variables in this report is one way of describing (albeit extremely limited) these families.

TABLE - 1

PERCENT DISTRIBUTION OF HEARING STATUS OF PARENTS AS REPORTED BY FOUR STUDIES

HEARING STATUS OF BOTH PARENTS	U.S. DEAF POPULATION STUDY, SCHEIN 1974	ODS NATIONAL SAMPLE, 1977	KARCHMER ET AL, 1981	FAMILY ENVIRONMENT SAMPLE, 1983
DEAF	3	3	2.6	18
HEARING	92	91	*	78
OTHER: HARD OF HEARING OR ONE PARENT HEARING IMPAIRED OR UNKNOWN	5	6	*	4

*Data unavailable.

TABLE - 2

PERCENT DISTRIBUTION OF EDUCATIONAL ATTAINMENT OF FAMILY ENVIRONMENT STUDY PARENTS OF DEAF CHILDREN AND COMPARISON DATA FOR A NATIONAL SAMPLE OF PARENTS OF DEAF CHILDREN AND THE GENERAL U.S. POPULATION, 1979

	U.S. GENERAL POPULATION[a]		NATIONAL SAMPLE PARENTS OF DEAF CHILDREN[b]		FAMILY ENVIRONMENT SAMPLE PARENTS	
LEVEL OF EDUCATION	MALES	FEMALES	FATHERS	MOTHERS	FATHERS	MOTHERS
ELEMENTARY 0-8 yrs.	16	15	21	18	3.3	5
HIGH SCHOOL 1-4 yrs.	52.5	52.5	52	66	21.7	37
COLLEGE 1-4 yrs. (OR MORE)	31.5	32	27	17	75	58

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[a] U.S. Bureau of the Census, Current Population Reports, Series P-20, No. 360, School Enrollment-Social and Economic Characteristics of Students: October 1979, U.S. Government Printing Office, Washington, D.C., 1981.

[b] Rawlings, B.W. and Jensema, C.J. Two studies of the families of hearing impaired children. Washington, D.C.: Gallaudet College, Office of Demographic Studies, 1977.

TABLE - 3

PERCENT DISTRIBUTION OF OCCUPATIONS OF FAMILY ENVIRONMENT STUDY PARENTS OF DEAF CHILDREN AND COMPARISON DATA FOR A NATIONAL SAMPLE OF PARENTS OF DEAF CHILDREN AND THE GENERAL U.S. POPULATION

	U.S. GENERAL POPULATION[a]		NATIONAL SAMPLE PARENTS OF DEAF CHILDREN		FAMILY ENVIRONMENT SAMPLE PARENTS	
OCCUPATION CATEGORY	MALES	FEMALES	FATHERS	MOTHERS	FATHERS	MOTHERS
I. SERVICE and FARM WORKERS (JOB REQURING HIGH SCHOOL OR LESS)	36.5	32	42	33	28	39
II. CLERICAL, SALES, CRAFT AND KINDRED WORKERS (BLUE-COLLAR) (JOB REQUIRING HIGH SCHOOL PLUS SOME COLLEGE OR TRAINING)	33	43	31	50	40	41
III. PROFESSIONALS, ADMINISTRATORS, MANAGERS, ENGINEERS (WHITE-COLLAR) (JOB REQUIRING HIGHEST COLLEGE DEGREE OR A DEGREE	30	24	28	18	32	21

[a] U.S. Bureau of the Census, Current Population Reports, Series P-20, No. 374, Population Profile of the United States: 1981, U.S. Government Printing Office, Washington, D.C., 1982.

TABLE 4

PERCENT DISTRIBUTION OF LIFETIME BIRTHS EXPECTED BY WOMEN 18-34 IN GENERAL POPULATION IN 1980 AND MOTHERS OF DEAF CHILDREN IN TWO STUDIES

NUMBER OF CHILDREN BORN	WOMEN IN THE GENERAL POPULATION[a] 1980	ODS DATA[b] 1974	FAMILY ENVIRONMENT DATA, 1983[c]
1	13.9	8	13.7
2	47.3	22	39.5
3	18.7	26	25
4	6.3	17	13.7
5 or more	2.9	28	8

[a] U.S. Bureau of the Census, Current Population Reports, Series P-20, No. 375, Fertility of American Women: June 1980, U.S. Government Printing Office, Washington, D. C., 1982.

[b&c] Both of these groups of women gave birth to at least one hearing impaired child.

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APPENDIX C

RATERS' MANUAL

RATERS' MANUAL

Instructions for Rating Communication Competency
from Videotaped Families at Dinner

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The Rating Scales[1] found on the following pages were used to evaluate the parents' and deaf child's communicative competency from videotaped families at dinner collected for the study of families and their learning environments for deaf children. Family size, including parent(s) and child(ren) ranged from two (2) to five (5). Of the children, one (the target child) was deaf and between the ages of 10 and 13 years.

The Rating Scales

The scales for rating parental and child communication competency from the videotapes are organized into six categories:

1. Ten items are designed as descriptive of the mother's communicative behavior: her approach to communication with the deaf child, her response to communication, her personal communicative style.
2. Ten items are designed as descriptive of the father's communicative behavior: his approach to communication with the deaf child, his response to communication, his personal communicative style.
3. Eleven items are descriptive of the child's communicative behavior. Most of these parallel the items descriptive of the parents' behavior. An additional item describes the child's attention span.
4. Four items describe the reciprocal nature of the mother-child interaction.
5. Four items describe the reciprocal nature of the father-child interaction.
6. One item describes the general communication environment among all family members.

The Point System

Each communication dimension is placed on a seven-point scale, with "1" defined as the negative, minimum, or "undesirable" end of the continuum, and "7" defined as the positive, optimum, or "desirable" end of the continuum.

In thinking about verbal equivalents of each of the seven possible points for rating, this may be helpful:

	Minimum	Below Average	Average	Above Average	Optimum	
1)	2	3	4	5	6	(7
Extremely Negative, Minimum						Extremely Positive, Optimum

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[1] Many of the rating scales and the methodology followed herein by the judges are adapted from work on mother-child interaction developed by Kathryn Meadow and Hilde Schlesinger in 1970.

The question mark is included for cases in which the rater is unable to evaluate the subject's behavior, or where the interaction as it develops gives insufficient opportunity for making a judgment. There should be few occasions when raters find it necessary to circle the question mark.

Procedures for Ratings

Independent Assessments

Each tape will be played through once, from beginning to end, with the three judges watching it together all the way through. It is of the utmost importance that no remarks, exclamations, observations, comments, or expressions of opinion be made during the time the tape is being shown. It is expected that each of the three judges fill out the rating scales in a way which reflects only his/her own opinion, and that he/she not be influenced, either consciously or unconsciously, by the opinion expressed by another person who is watching. After the tape has been watched all the way through, each judge will circle one number which expresses his/her evaluation of the parent-child communication for each of the items. The tape may be viewed again if the judges feel it is necessary. When this has been done, the judges' ratings will be recorded on forms so that the degree of agreement or disagreement may be evaluated (See attached).

For some items, judges will need to arrive at consensus from their individual ratings. For others, the judges' ratings will be averaged. After the judges complete all their individual ratings for the tape, they should discuss the consensus items.

Arriving at a Consensus

In some cases, a composite rating will be automatic -- that is, when the three judges are in fairly close agreement. Where there is a predetermined degree of disagreement, a consensual, or compromise rating should be determined through discussion of the observations noted by the three which influenced their final independent decision. This process of consensus will be followed for: M1 through M3, F1 through F3; C1, C2, C4, C5; C13 and R1 through R4.

The following "rules" will be followed for determining those cases of automatic and achieved consensus:

1. When the three judges all assign the same rating for a particular item, the composite rating would obviously be the same: for example,
   6 - 6 - 6 = 6

2. When two of the three judges assign the same rating for a particular item, and the third judge is only one "step" away, the composite rating assigned will be that of the majority: for example,
   4 - 4 - 5 = 4; 3 - 4 - 4 = 4;
   6 - 6 - 7 = 6; 7 - 7 - 6 = 7

3. When the three judges all assign a different rating, but the three ratings form a step sequence, the composite rating automatically becomes the middle figure:

   4 - 5 - 6 = 5;   1 - 2 - 3 = 2

4. In other cases of disagreement, judges will discuss the observed behavior which influenced their ratings. In some cases, the person who is in the minority may influence the two in the majority to her/his way of thinking, by citing a particularly convincing example or two which the others might have missed or interpreted differently. In other cases the two who are closer together may convince the minority person to change her/his mind. 3 - 6 - 7 = ??; 4 - 4 - 6 = ??; 1 - 2 - 5 = ??; consensual rating will be left blank.

Supervision of this process will occur until the judges become familiar with the principles involved. Because of the plan for judges to watch the tapes together and arrive at the consensual judgment, it is important that each judge be present each day that viewing is scheduled, and that each person arrive punctually at the appointed time.

Agreement Items

On all other items: M6-M12; F6-F12; C6-C12 and G1, the judge's independent ratings will be averaged for scoring purposes.

Ratings for Mothers (and Fathers)

The next few pages describe the rating scales in detail. Judges should study the information so that they are very familiar with what each of the rating scale means and get a "feeling" for the seven-point scale.

The first and second categories, Ratings for Mothers and Ratings for Fathers, are identical. Thus, only one is described here, Ratings for Mothers: M1 - M12 with the understanding that the judges will be filling in a separate Ratings for Fathers: F1 - F12, and should apply the information from this section substituting the word father for mother.

M1 Level of Comfort During Communication

Tense, uncomfortable, anxious	? 1) 2 3 4 5 6 (7	Relaxed, comfortable, at ease

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Negative values: A tense mother is one who appears aware of the scrutiny of the camera, whose voice, signing or body may indicate tension, whose communication with the child appears to be determined by her own state of tension, rather than by the child's needs or the requirements of the situation. She may always speak in a shrill voice; she may move or fidget restlessly; she may display nervous mannerisms such as scratching herself, wringing or twisting her hands, tapping her foot or other objects. She may glance at the camera repeatedly and smile self-consciously.

Although too much relaxation sounds incongruous it could apply to a mother who appears to lack energy and whose movements are slow and limp. An extreme case may be a person suffering from depression, a "1" rating.

Optimum values: The calm and comfortable mother will be characterized by her ease of movement, and the comfortable pitch of her voice or signing style. She appears to engage in communication with her child in a manner which is not self-conscious.

M2 Use of Body Language, Non-verbal Communication, Gestures

Makes little use of gesture, body language, physical movement	? 1) 2 3 4 5 6 (7	Makes frequent use of gesture, body language, physical movement

Negative values: A physically constrained mother is one who appears to use a paucity of body language in sending messages to the child. She may appear to be almost motionless. She may limit her movements, even when non-verbal communication could and perhaps should be used to further the child's understanding. She may inhibit body language for expressive purposes: for expressing approval or disapproval of the child. Gesturing body language is ineffective or inappropriate.

The mother who makes an exaggerated use of her body or of gestures may appear to have a frenetic quality to her body language which actually interferes with the communication of either affective or cognitive information. She should receive a "1" rating.

Optimal values: The mother who is rated with a "6" or a "7" should use body language and gesture appropriately to express affect and to implement instruction. Thus, a mother might imitate an animal or pantomime walking when these means can give the child additional information.

M3 Enjoyment of Communication with Child

Low apparent enjoyment of communication with child	? 1) 2 3 4 5 6 (7	High apparent enjoyment of communication with child

Negative values: The mother with low enjoyment of her communication with the child is one characterized by a certain woodenness, absence of smiling or of positive affect, by an absence of verbal (or signed) statements of her own pleasure. She may appear to consider the communication time spent with the child as a burden or a chore, or she may appear to regard the child merely as a receptacle or a recipient of maternal favors. This mother may fail to show much beyond polite interest in the child.

The mother with an exaggerated expression of enjoyment may appear "saccharine" in the situation. She may look as if she feels that one must be cheerful at all times, or at least when one is dealing with children. She conveys a non-genuine quality in her expressions of affection, as if she might be attempting to impress an observer with the depth of her devotion. She should get a "1" rating.

Optimum values: The mother who has high apparent enjoyment of the communication with her child has a bouyancy and an enthusiasm which appear quite genuine to the observer. She expresses joy and pleasure, she may smile

or laugh frequently, express delighted surprise at the child's mastery/remarks/thoughts which she finds unexpected. She may hug, kiss, or touch the child in expression of affection.

M6 Use of Voice

Little or no use of voice ? 1) 2 3 4 5 6 (7 Frequent use of voice

M6 refers to vocal production whereas M5 has reference to a more complex verbal production.

Negative values: The mother who is striking for her absence of vocal noise should be rated "1," and there may be hearing and deaf mothers whom you will see to be silent throughout most (or all) of the videotape.

A mother who goes overboard in vocal production, constantly talking, singing, screaming or who makes so much use of vocal sound that their voice becomes unnerving should also get a negative rating of "1."

Optimum values: The mother who makes frequent vocal sounds should receive a high rating of "6" or "7" whether these may be said to be expressive of emotion (pleasure, anger, frustration, surprise) or of symbolic meaning (language--understandable or not) or in play (humming, singing for pleasure).

M7 Understandable Speech

Little or no understandable speech ? 1) 2 3 4 5 6 (7 Much understandable speech

This characteristic of the mother should be rated primarily from the perspective of the rater's understanding what the mother says. There may be a situation where the technical quality of the auditory track impacts negatively on the vocal reproduction. In this case, the rater should take into account the "receiver's" apparent understanding of a word or phrase if the rater also believes the mother has made an approximation of the sound(s) to which the receiver has responded.

The comparative context for rating the hearing mothers should be on a continuum of all hearing women. The comparative context for rating the deaf mothers should be on a continuum of all severely to profoundly deaf women. Do not compare the deaf mothers to hearing women in terms of their speech production, but only to other deaf women. This means that at least a few of the deaf mothers (and probably all of the hearing mothers) will receive ratings of "6" or "7." (If the deaf mothers were compared to hearing women, the highest rating we might expect them to get might be a "3" or so).

There will obviously be some carry-over between ratings on M7 (understandable speech) and M6 (use of voice) in the sense that those mothers who are virtually silent during the videotaping (and thus are rated "1" or "2" for M6) will also, by definition, be rated a "1" or "2" for M7. However, the mother who speaks very rarely, but is understandable when she does attempt to say a word might receive a higher rating on M7 rather than a "1" or "2."

M8 Response to Sound

No apparent response to sound	? 1) 2 3 4 5 6 (7	Frequent response to sound

Most if not all of the hearing mothers are expected to have a "normal" response of "7" to environmental and speech sounds. That is, they will turn toward, comment on or otherwise demonstrate they auditorially perceived (not necessarily understood) the sound. The rater should consider any interfering noise when rating this characteristic.

In deaf mothers, the rater will see variation in their apparent responses to sound. That is, they may or may not always turn toward the sound source whatever it is. A deaf mother should receive a high ("6" or "7") rating if she frequently and consistently responds to a range of sounds.

M9 Voice Quality

Unpleasant vocal quality	? 1) 2 3 4 5 6 (7	Pleasing vocal quality

"Pleasing" and "displeasing" is a dimension even more subjective than many others which are to be rated. Admittedly, a sound which drives one person to distraction may seem only mildly unpleasant to another. Some sound frequencies bother some individuals more than they do others. There are even variations between men and women in the kinds and intensities of sound which would be called displeasing. Even within these limitations, however, the judges will probably be in fair agreement, at least for the extreme cases.

Mothers (deaf and hearing) who make little or no use of their voices should be rated "?". Those who have shrill, shrieking voices which a rater finds very unpleasant should be given a "1". Those whose vocal (not verbal) quality most closely approximates that of hearing women will probably receive the highest ratings: a "6" or a "7". Hearing mothers will most likely receive a high rating of "6" or "7." Obviously, this may not always be the case, since some hearing mothers have shrill, whining, overly-loud and other types of vocal qualities which a particular listener may find unpleasant.

M10 Understandable Manual Symbols

Few or no understandable manual symbols	? 1) 2 3 4 5 6 (7	Many understandable manual symbols

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This characteristic of the mother should be rated primarily from the perspective of the rater's understanding what the mother signs or fingerspells. There may be a situation where the technical quality of the video impacts negatively on the visual reproduction. In this case, the rater should take into account the "receiver's" apparent understanding of a sign or sign phrase if the rater also believes the mother has made an approximation of the sign or fingerspelling to which the receiver has responded.

The comparative context for rating the hearing mothers should be on a continuum of all hearing persons who have learned to sign (not "native"). The comparative context for rating the deaf mothers should be on a continuum of all severely to profoundly deaf persons who are probably "native" signers. Do not compare the hearing mothers to deaf persons in terms of their manual symbol production, but only to other hearing persons, who probably learned to sign. This means that at least a few of the hearing mothers (and probably all of the deaf mothers) will receive ratings of "6" or "7." (If the hearing mothers were compared to deaf mothers who are native signers, the highest rating we might expect them to get might be a "3" or so).

There will obviously be some carry-over between ratings on M10 (understandable manual symbols) and M2 (use of body language, gestures) in the sense that those mothers who are virtually without gestural movement during the videotaping (and thus are rated "1" or "2" for M2) will also, by definition, be rated a "1" or "2" for M10. However, the mother who gestures very rarely, but is understandable when she does attempt to sign a word might receive a higher rating on M10 rather than a "1" or "2."

M11 Eye Contact for Communication

Little or no eye contact	? 1) 2 3 4 5 6 (7	Frequent, appropriate eye contact

Eye contact is a social reinforcer for conversation, discussion or probably any face-to-face communication.

Negative values: Judges should give a low rating of "1" or "2" to the mother who seems to avoid eye contact with her deaf child most of the time. This mother would appear to be consistently "not looking" at the child so as to avoid having to respond or seek communication with him/her (an extreme case). This is especially noticeable if the child tries to get and hold her attention so he/she could tell her something.

Optimum values: Mothers who are sensitized or "tuned in" to communication with the child would have frequent eye contact with him/her so that she is prepared to respond and/or can readily initiate communication. A mother would receive a "6" or "7" for this apparent and appropriate eye contact. The mother's eye contact should "match" the child's apparent "need" for eye contact. Obviously, the mother should not go overboard and stare at the child while ignoring other elements in the environment. Judges should reflect differences in the mother's ability to "tune in" via appropriate eye contact.

M12 Quality of Manual Symbols

Unpleasant quality	? 1) 2 3 4 5 6 (7	Pleasing quality

"Pleasing" and "displeasing" is a dimension even more subjective than many others which are to be rated. Admittedly, a signing style which drives one person to distraction may seem only mildly unpleasant to another. Some signing characteristics bother some individuals more than they do others. Even within these limitations, however, the judges will probably be in fair agreement at least for the extreme cases.

Negative values: Mothers (deaf and hearing) who make little or no use of manual symbols should be rated "?". Those whose signing "style" is offensive to you, extreme in some quality, e.g., too large for the situation, signer looks away, lacks eye contact, should be given a "1," "2." Other characteristics may be offensive to a particular judge and should be considered under "quality" (M12) and not understanding (M10).

Optimum values: Those whose gestural movement and signing quality (not content) are smooth, rhythmical, precise and "personal" to the receiver -- or whose other characteristics the judges find pleasing -- should receive a "6" or "7" rating. Obviously deaf mothers may not automatically receive a high rating since they could have a style of signing the quality of which is, overall, not pleasing to the observer.

Ratings for Children

C1 Level of Comfort During Communication

Tense, uncomfortable, shy, fearful	? 1) 2 3 4 5 6 (7	Relaxed, comfortable

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Negative values: The child who is extremely tense and uncomfortable in communication with his/her parents may speak and/or sign in an extreme fashion; he/she might display other mannerisms reflecting nervousness. The child appears anxious, self-conscious and under scrutiny. His/her body indicates tension. Topics of communication seem to be determined by his/her state of discomfort rather than by the requirements of the situation.

There is a theoretical possibility of observing a child who exhibits an extreme degree of relaxation, to the point where he seems to have little body tone or "tension" -- he is "atonic". Perhaps he seems listless or sleepy. His relaxed attitude seems not so much to result from his feeling "at home" and comfortable as from apparent disinterest in or boredom with what is going on. He/she should receive a "1."

Optimum values: The calm and relaxed child will be characterized by her/his ease in movement during communication and a comfortable signing style (and perhaps voice quality). The communication is not self-conscious but, rather, is at ease, "at home."

C2 Use of Body Language, Non-Verbal Communication, Gestures

Physically constricted, exhibits very little body movement or gesture	? 1) 2 3 4 5 6 (7	Frequent body movement, much non-verbal communication and gesture

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Negative values: The child who is physically constricted may seem to lack freedom or to be restrained in expressing himself. He may use gestures which are very small in their scope (or no gestures at all). These children may seem tense, hold their hands woodenly at their sides, hunch their shoulders and keep their elbows held stiffly against their bodies.

An excess of activity, which the mother seems to find unmanageable (and appropriately so, from the rater's point of view), would be given a "1." This behavior could be referred to as "hyperactivity," but this has been deliberately set off in quotation marks since you are not being asked for a clinical judgment of pathological behavior. You should merely reflect what seems to be inappropriate or excessive body movement. The child who is rated as "hyperactive" -- would also probably be given a rating of "1" on Item C13, indicating that he is also distractable.

Optimum values: The child who is rated as showing a good deal of body movement, and much physical activity, may be characterized as using very broad, (and appropriate), but smooth gestures, a great deal of pantomime with arms, body, head and shoulders. You may include mobile facial expressions (or the lack of them) to contribute to the decision on this rating.

C4-C5 Enjoyment of Communication with Mother and/or Father

Low apparent enjoyment of communication with mother/father	? 1) 2 3 4 5 6 (7	High apparent enjoyment of communication with mother/father

Negative values: The child who is rated "1" on apparent enjoyment of communication with his/her mother and/or father may appear to be sullen, to smile rarely, to resist her/his parent's suggestions, or ignore her/him entirely. He/she may appear to enjoy the meal or the videotaping, but still be given a low rating for enjoyment of communication with his/her mother and/or father.

The behavior of the child who has an exaggerated response to his/her mother's/father's presence: that is, who appears to derive all of his/her gratification in the situation from her/his mother's/father's approval and/or her/his suggestions should also receive a "1."

Optimum values: The child who is given the optimum rating of "7" will give many visible signs of genuine enjoyment of being with the mother/father and communicating with them. The child may give the parent(s) a hug or a kiss. He/she may smile at them often or laugh as they share a joke or tell a story.

C6 Use of Voice

Little or no use of voice	? 1) 2 3 4 5 6 (7	Frequent use of voice

C5 refers to vocal production, where C6 has reference to a more complex verbal production.

Negative values: The child who is striking for his absence of vocal production should be rated "1", and there may be several deaf children whom you will see to be silent throughout most (or all) of the tape.

A child who goes overboard in vocal production, constantly screaming, grunting, yelling, talking, or singing should receive a "1" rating.

Optimum values: The child who makes frequent vocal sounds should receive a high rating ("6" or "7") whether these may be said to be expressive of emotion (pleasure, anger, frustration, surprise) or of more symbolic meaning (attempt at language which are or are not understandable) or in play (humming or singing for pleasure, imitating noises of cars and trucks).

C7 Understandable Speech

Little or no understandable speech	? 1) 2 3 4 5 6 (7	Much understandable speech

In rating this characteristic, the first question of definition which may arise is: "understandable to whom -- the rater watching the interaction, or the person to whom the spoken messages were conveyed by the child?" This particular rating will be defined as referring primarily in terms of the rater's understanding of what the child says. (The mother's and father's apparent understanding of the child's spoken messages will be one of the factors contributing to the rating given for "reciprocal mother/father-child understanding"). The word "primarily" is inserted as a qualification of the definition of this dimension because the technical quality of the vocal reproduction varies somewhat from one tape to another and the sound reproduction in some cases in not optimal. Therefore, judges should take into account a mother's/father's apparent understanding of a word or phrase if the rater also believes that the child has made an approximation of the sound or sounds to which the mother has responded.

Secondly, the comparative context for rating the children should be on a continuum of all severely to profoundly deaf children. That is, do not compare the deaf children to hearing children in terms of their speech production, but only to other deaf children. This means that we should find that at least a few of the children have ratings of "6" or "7". (If they were compared to hearing children, the highest rating we might expect for any of the deaf children might be a "3" or possibly a "4").

There will obviously be some carry-over between ratings on C7 (understandable speech) and C6 (use of voice) in the sense that the children who are almost or completely silent during the taping (and thus are rated "1" or "2" for C6) will also, by definition, be rated a "1" or "2" for C7. However, the child who speaks very rarely, but is understandable when he/she does attempt to say a word might receive a rating of "2" or "3" on C7, rather than a "1" or "2".

C8 Response to Sound

No apparent response to sound	? 1) 2 3 4 5 6 (7	Frequent response to sound

Although the deaf children included in this research study have been tested and shown to have a decibel loss so severe that they would seem to have no usable hearing in the speech range, you will see some variation in their apparent response to sound. That is, they will often or sometimes turn toward their mothers/fathers when their name is called, or when some other vocal signal is given. They may appear to turn toward the door at the sound of a knock. They may demonstrate that they heard some extraneous noise in the room which has also been picked up by the microphone. They may "comment" on some particular sound. The child should receive a "6" or "7" if she/he consistently and frequently responds to a range of sounds.

C9 Voice Quality

Unpleasant vocal quality	? 1) 2 3 4 5 6 (7	Pleasing vocal quality

"Pleasing" and "displeasing" is a dimension even more subjective than many others which are to be rated. Admittedly, a sound which drives one person to distraction may seem only mildly unpleasant to another. Some sound frequencies bother some individuals more than they do others. There are even variations between men and women in the kinds and intensities of sound which would be called displeasing. Even within these limitations, however, it is expected that the judges will be in fair agreement, at least for the extreme cases.

Children who make little or no use of their voices should be rated "?." Those who have shrill, shrieking voices which a rater finds very unpleasant should be given a "1." Those whose vocal (not verbal) quality most closely approximates that of a hearing child will probably receive the highest ratings: a "6" or a "7." Obviously, this may not always be the case, since some hearing children have shrill, whining, overly-loud or other types of vocal qualities which a particular listener may find unpleasant.

C10 Understandable Manual Symbols

Few or no understandable manual symbols	? 1) 2 3 4 5 6 (7	Many understandable manual symbols

This characteristic of the child should be rated primarily from the perspective of the rater's understanding what the child signs or fingerspells. There may be a situation where the technical quality of the video impacts negatively on the visual reproduction. In this case, the rater should take into account the "receiver's" apparent understanding of a sign or sign phrase if the rater also believes the child has made an approximation of the sign or fingerspelling to which the receiver has responded.

The comparative context for rating the deaf children should be on a continuum of severely to profoundly deaf children of about 10-12 years of age who probably learned to sign at about 3-5 years of age or earlier. A deaf child with deaf parents who learned to sign as an infant would probably reflect a high rating of "7."

There will obviously be some carry-over between ratings on C10 (understandable manual symbols) and C2 (use of body language, gestures) in the sense that those children who are virtually without gestural movement during the videotaping (and thus are rated "1" or "2" for C2) will also, by definition, be rated a "1" or "2" for C10. However, the child who gestures very rarely, but is understandable when she/he does attempt to sign a word might receive a higher rating on C10 rather than a "1" or "2."

C11 Eye Contact for Communication

Little or no eye contact	? 1) 2 3 4 5 6 (7	Frequent, appropriate eye contact

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Eye contact is a social reinforcer for conversation, discussion or probably any face-to-face communication.

Negative values: Judges should give a low rating of "1" or "2" to the child who seems to avoid eye contact with his/her parents most of the time. This child would appear to be consistently "not looking" at the parent so as to avoid having to respond or seek communication with them (an extreme case). This is especially noticeable if the parent tries to get and hold the child's attention so they could tell him/her something.

Optimum values: Children who are sensitized or "tuned in" to communication with their parents would have frequent eye contact with them so that they are prepared to respond and/or can readily initiate communication. A child would receive a "6" or "7" for this apparent and appropriate eye contact. The child's eye contact should "match" the parent's apparent "need" for eye contact. Obviously, the child should not go overboard and stare at the parent while ignoring other elements in the environment. Judges should reflect differences in the child's ability to "tune in" via appropriate eye contact.

C12 Quality of Manual Symbols

Unpleasant quality	? 1) 2 3 4 5 6 (7	Pleasing quality

"Pleasing" and "displeasing" is a dimension even more subjective than many others which are to be rated. Admittedly, a signing style which drives one person to distraction may seem only mildly unpleasant to another. Some signing characteristics bother some individuals more than they do others. Even within these limitations, however, the judges will probably be in fair agreement at least for the extreme cases.

Negative values: Children who make little or no use of manual symbols should be rated "?". Those whose signing "style" is offensive to you, extreme in some quality, e.g., too large for the situation, signer looks away, lacks simultaneous eye contact, should be given a "1", "2." Other characteristics may be offensive to a particular judge and should be considered under quality (C12) and not understanding (C10).

Optimum values: Those whose gestural movement and signing quality (not the content) are smooth, rhythmical, precise and personal -- or whose other characteristics the judges find pleasing -- should receive a "6" or "7" rating.

C13 Attention Span

Distractable, short attention span	? 1) 2 3 4 5 6 (7	Attentive for long periods

Negative values: The child who is distractable, who has a short attention span is unable or unwilling to concentrate on a single aspect of his/her environment for a period of time which would enable him/her to learn from or about it. (This includes the dimension which involves a period of time long enough for the mother or other caretaker to comment or explain its significance to the child). This refers to the child who appears to be distracted by internal stimuli and not to the child who is distracted by overt external ones. Thus, the child whose mother's or father's attention, commands or observations to her/him flit quickly from one topic or object to another, should not be rated "1." The distractable rating should be reserved for that child who cannot sit still long enough to eat his/her dinner with the family or who seems unable to be attentive to a bit of communication.

A negative rating should be given the child who is so attentive that he seems incapable of shifting his/her attention from one topic or object to another, even when coaxed to do so by his/her mother or father, or when the external situation would seem to demand it.

Optimum values: The child who demonstrates that he/she is capable of attending to the meal and conversation among/between family members (the understanding level may vary) and can maintain interest for a long period of time while still retaining the ability to shift his/her attention to different topics, should be given the optimum rating ("6" or "7").

What of the child who demonstrates a high degree of distractability during one part of the dinner (e.g., the end), but demonstrates a high degree of attentiveness during another portion of the dinner (e.g., the beginning)? This child should receive a "middle" rating, i.e. "4" or "5", depending on the rater's judgment of the strength of the direction in which his/her behavior seems to "tip the scale."

Ratings for Reciprocal Mother-Child (and Father-Child) Communication

The next five scales should be applied identically to both mother-child and father-child communication. Only the mother-child communication is described here in order to save space and avoid redundancy. Judges will be rating father-child separately from mother-child communication. Again, substitute the word father for mother in that application.

R1 Level/Amount of Mutual Understanding

Mother and child appear to have little or no mutual understanding	? 1) 2 3 4 5 6 (7	Mother and child appear to have complete understanding

R2 Level/Amount of Mutual Gratification from Communication

Mother and child appear to gain little or no mutual gratification from their communication - frustration high for both	? 1) 2 3 4 5 6 (7	Mother and child appear to gain a great deal of mutual gratification from their communication

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The key to both of these scales, R1 and R2, lies in the words "reciprocal" and "mutual." For R1, we are interested in the relative degree to which the mother-child dyad shows mutual or reciprocal understanding of each other's messages: both verbal and non-verbal. For R2, we are interested in the degree to which the mother and child appear to gain reciprocal or mutual gratification from their communication.

In order for the pair to receive a high rating for understanding, the mother must understand the child's requests, observations, jokes, demands, and questions whether these are communicated through speech, vocalization, gesture, pantomime, sign language, facial expression, and the child must demonstrate that she/he understands the mother's requests, observations, admonitions, and commands, by whatever communicative mode the mother sends the messages. (The child need not follow the mother's commands, but should make some sign which indicates he has understood that a command, etc., was made.) The same principle holds for high ratings for R2: Both mother and child must appear to find pleasure in their communication.

R3 Spatial Distance, Placement of Mother and Child for Communication

Spatial distance is almost always too close or too far	? 1) 2 3 4 5 6 (7	Spatial distance appropriate for mother and child

Negative values: The extreme rating of "1" for the mother-child pair should be assigned when the spatial distance between the two is: a) too close--when they seem to be relying on actual physical contact or spatial closeness for security-reassurance. One or the other may seem to be "smothering" or "clinging." There may be several examples of the child's sitting on the mother's lap either at her insistence, or when the child has initiated the contact; b) too far--when they seem to be placed out of range for either visual/manual or oral/aural communication. One or the other may seem to "avoid" or "reject" being in spatial communication range with the other. There would probably be a lot of avoidance behavior in either mother or child.

Optimum values: The high values of "6" or "7" should be assigned when both mother and child keep an appropriate spatial distance for communication, whether oral/aural or visual/manual. You could probably observe movement regarding placement of the mother and child but they seem always to have a "sense" of being a receiver (and so are ready) and a sender in the communication process.

R4 Balance of Messages Sent and Received

Great imbalance in messages sent and received, either mother or child greatly overweighted	? 1) 2 3 4 5 6 (7	Number of messages sent and received approximately equal, neither mother nor child has disproportionate number

Negative values: This item is based on the premise that in any human interaction, including that of children and adults, communication must be two-way; that is, neither of the two members of a communicative dyad should send a greatly disproportionate number of the messages. Thus, you are asked to give a "low" rating to those mother-child pairs where *either* the mother or the child sends a largely disproportionate number of the messages (verbal or non-verbal). (For any pairs you rate with a "1" or "2" or a "3", please check whether it was the *mother* or the *child* who sent the larger number of messages).

Optimum values: The optimum is seen here as being an equivalent number of messages sent by each individual. Thus, the optimum rating in this case would be "7" and "6" with "4" and "5" representing, as usual, the middle or average categories.

Rating for General Family Communication Environment

G1 Amount of Family Communication

Very quiet, little or no communication	? 1) 2 3 4 5 6 (7	Appropriate amount of communication

Rating of the overall level/amount of communication in the family should be considered. Does there appear to be a consistent communication level overall that is reflected in the videotape? The judges will need to consider the effect the presence of the videotaping might have on the level of communication. The judges are to reflect how much communication seems to go on in the family among each and all family members. This should provide some background against which some of the other ratings can be considered.

Negative values: Does the family seem to only eat and not talk? If you judge the family to be *generally* quiet whether or not they are being videotaped, then give the family a lower rating of "1" or "2."

Positive values: The entire family appears to be "chatting" as they normally do (without videotaping) and does not appear to be straining to make conversation. If you judge the family to be *generally* communicative whether or not they are being videotaped, then give them a high rating of "6" or "7."

GALLAUDET COLLEGE
Barbara Bodner-Johnson

Family Environment Study
Family ID: __________
Rater #: __________

Communication Competency Rating Form

	Mother	Father	Child
*1. Level of comfort during communication	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )
*2. Use of body language, nonverbal communication, gestures	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )
*3 Enjoyment of communication with child	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )	
*4 Enjoyment of communication with mother			? 1) 2 3 4 5 6 (7 ( )
*5. Enjoyment of communication with father			? 1) 2 3 4 5 6 (7 ( )
6. Use of voice	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7
7. Understandable speech	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7
8. Response to sound	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7
9. Voice quality	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7
10. Understandable manual symbols	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7
11. Eye contact for communication	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7
12. Quality of manual symbols	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7
*13. Attention span			? 1) 2 3 4 5 6 (7 ( )

*=Consensus items; ( ) = Consensus Score

	Mother-Child	Father-Child	Child
*R1. Level/amount of mutual understanding	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )	( )
*R2. Level/amount of mutual gratification from communication	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )	( )
*R3. Spatial distance, placement of parent-child for communication	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )	( )
*R4. Balance of messages sent and received	? 1) 2 3 4 5 6 (7 ( )	? 1) 2 3 4 5 6 (7 ( )	( )
G1. Amount of family communication	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (7	? 1) 2 3 4 5 6 (

APPENDIX D

VARIABLE LIST

Variable List

Variables:	Labels:
VAR 230	Extent and content of recreational activities of parents and child
VAR 164	Parental aspirations for child's education--level achievement
VAR 170	Parents' expectations or standard for child's current grades
VAR 200	Child reads to parents in any communication mode
VAR 204	Extent child reads books on his/her own
VAR 205	Frequency parents help child with English grammar
VAR 209	Frequency parents introduce child to a new word and/or sign
VAR 210	Extent parents read books
VAR 211	Parents read to child at early age before preschool
VAR 213	Child brings books home to read from library, school or friend
VAR 231	Parents expect child to do homework regularly
VAR 232	How much time parents expect child to do homework
VAR 234	Parental preparation and planning for the attainment of child's educational goals
VAR 241	Parents' knowledge of content of child's school studies
VAR 242	Parents' knowledge of the child's grades/progress in school studies
VAR 276	Frequency parents discuss child's progress at school
VAR 243	Encyclopedias in home and parents discuss them with child
VAR 247	The extent and content of educational activities parents and child engage in together
VAR 254	Parent involvement in child's sporting activities
VAR 262	Time child watches TV on weekends
VAR 261	Parents' discussion with child of TV programs
VAR 266	At what age parents expect/allow child to earn spending money
VAR 268	At what age parents expect/allow child to go around the neighborhood to play where he/she wants
VAR 271	At what age parents expect/allow child to make certain decisions
VAR 288	Parents' manner of adapting to child's deafness
VAR 289	Parents' knowledge of level and nature of child's hearing loss
VAR 290	Parents' knowledge of type, function and appropriateness of child's hearing aid
VAR 291	Parents' knowledge of content of child's speech and auditory training
VAR 293	Frequency parents discuss child's progress in speech and auditory training
VAR 294	Frequency parents meet with teacher to discuss child's progress in speech and auditory training
VAR 295	Parents learned to sign relative to when the need became apparent

Variables:	Labels:
VAR 297	Parents' activities related to learning sign language
VAR 298	Frequency parents discuss child's general communication (receptive and expressive language) progress (oral or manual)
VAR 299	Frequency parents meet with teacher to discuss child's communication progress
VAR 300	Parents' knowledge of child's general communication abilities
VAR 301	Extent of parents' participation in deaf community
VAR 305	Frequency parents discuss deaf community
VAR 307	Parental belief regarding supervision needs of deaf children
VAR 311	Parental belief regarding the need to explain discipline rules and techniques
VAR 42	Parental satisfaction with child's school
VAR 43	Parental belief regarding amount of homework
VAR 46	Parental belief regarding amount of art, music, and drama
VAR 47	Parental belief regarding amount of reading instruction
VAR 48	Parents' belief that the child's school curriculum should include more mathematics
VAR 49	Parental belief regarding teacher's friendliness
VAR 50	Parental belief regarding teacher's fairness
VAR 51	Parental belief regarding teacher's interest in child's education
VAR 53	Parents' belief regarding child's time spent on special causes for deaf children
VAR 54	Parental belief regarding their welcomeness in the school
VAR 56	Parental belief regarding how well deaf and hearing children mix in school
VAR 57	Parental belief regarding the amount of information they receive about the child's school progress
VAR 259	Child's activities after school
VAR 260	Child's activities after evening meal
VAR 165	Parental expectations for child's education-level achievement
VAR 167	Parental aspirations for child's occupation-level achievement
VAR 173	Parents' jobs
VAR 174	Whether parents wish to change jobs
VAR 185	Frequency parents give child articles from newspaper or magazines
VAR 186	Extent of parents' English usage in the home
VAR 187	Extent of child's English usage in the home
VAR 188	Keenness of parents for correct and effective language usage
VAR 189	Quality of language usage of the parents
VAR 237	Frequency parents praise or congratulate child
VAR 286	Parents' beliefs regarding their adaptation to their child's deafness

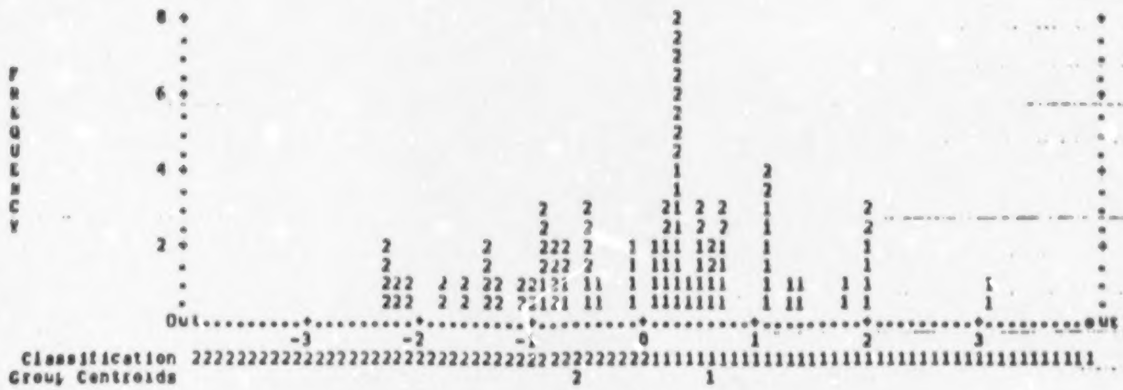
APPENDIX E

GROUP STACKED HISTOGRAMS FOR THREE DISCRIMINANT ANALYSES FOR FAMILY ENVIRONMENT PREDICTING ACADEMIC ACHIEVEMENT

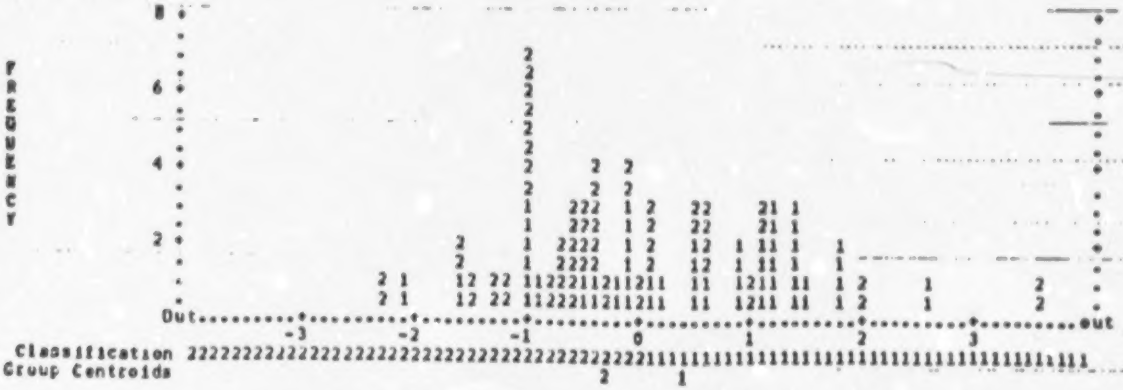
All-Groups Stacked Histogram

-- Canonical Discriminant Function 1 --

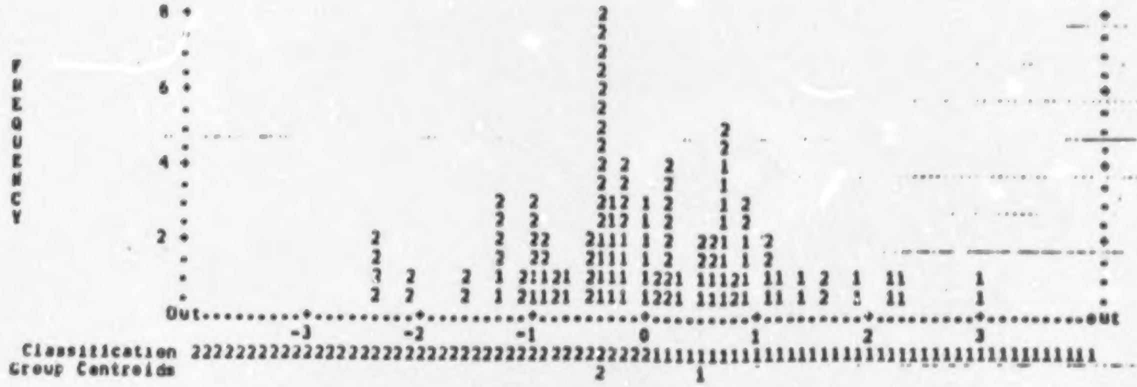
Reading Comprehension



Math Concepts



Math Computation



Symbols used in plots: 1= Low Achievers; 2= High Achievers

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